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AUTOMOTIVE INDUSTRIES

VOLUME 54 *Philadelphia, Thursday, March 18, 1926* NUMBER 11

Sixes Crowding Into Low Price Field; Eight Makes Now Under $1000

Over 300,000 cars of this class sold in 1925. Seven manufacturers offering six-cylinder closed models ranging from $790 to $995.

A LITTLE over four years ago was announced the first six-cylinder car selling for less than $1000. Two years later five manufacturers were building sixes with the open models priced at less than $1000, but only one closed job was under $1000 at that time.

Today the lowest priced five-passenger closed car in seven six-cylinder lines sells for less than $1000; open models on five lines are available under that price.

In only four years the low-priced six has grown from a place of insignificance so far as the quantity production market is concerned to one of real importance and competition in this field is becoming more keen every day.

Speculation about future trends as regards low-priced sixes is stimulated by the recent Essex price reduction which results in making it possible for the public to have a six-cylinder closed car delivered at its door at a lower price than ever before. Study of six-cylinder price and production trends during the last four years and of the situation as it exists today shows one thing clearly: Future competition between the six and the four seems likely to be on the basis of sheer merit of the various models produced in each class, because the price advantage formerly held by the four no longer is so large as to be of major importance and, as a matter of fact, bids fair to grow less as time goes on.

There are now on the market seven six-cylinder closed cars selling for less than $1000, as already noted. The average price of these seven models is $904.28. The range is from $790 to $995.

Eight makes of four-cylinder closed cars are being sold for less than $1000—or to be more exact, the lowest priced five passenger closed car in the lines of eight manufacturers is priced at less than $1000. The average price of these eight models is $751.25 or only about $143 less than the average for the six-cylinder group. If Ford be excluded from the four-cylinder list, the average price would be raised to $785.71 or about $118 less than that of the six-cylinder group.

A difference of $125 to $150 in price is not insignificant on cars where the total price is low, but even on models of this type $150 dollars differential is less important than it was a few years ago because of the greater number of cars bought on the instalment plan and because of the more liberal financing terms which have become common.

When the Hanson Motor Car Co., announced the first six to sell under $1000 at the New York Show in January, 1922, no great furor was created. Lack of great interest rested partly in the fact that the announcement was made by a small rather than a large unit in the trade. The Hanson light six, the open model of which was priced at $995, had a 112-in. wheelbase, carried five passengers, and was designed to be assembled from standard units for the most part. So far as we know only a very few of these models were ever made. But that announcement, four years ago, did mark the start of a new merchandising era for the six-

Eight Six-Cylinder Models Under $1000

Car	Open	Closed
Ajax	$865	$995
Cleveland	945	...
Essex	...	790*
Jewett	...	995
Oldsmobile	875	950
Overland	895	895
Pontiac	...	825
Star	695	880

* Delivered in Detroit zone.

cylinder car in the American automobile market.

"A low priced six!" The idea intrigued a good many engineering and sales minds in the industry. They thought about it a good bit. And they went to work. The result is that last year over 300,000 six-cylinder cars were sold to the public for less than $1000, when four years previous not a single six was bought for so low a price. In 1923, as a matter of fact, only two years before, less than 100,000 sixes were sold for under $1000. In the two years from 1923 to 1925 the sale of low-priced sixes more than doubled.

The number of cylinders in the engine of a car is only one of a multitude of factors, of course, which determine its desirability from the standpoint of the prospect or its salability from the standpoint of the manufacturer. Some of the cars with four-cylinder engines have done much better than some of the lower priced sixes and probably will continue to do so for a long time. Cylinders alone can't determine whether or not a car is going to sell well. In the last twenty-four months, however, a tremendous impetus has been given to sales of six-cylinder cars through the material decrease in prices which have been brought about in that field.

All Have Not Succeeded

Not every maker who has gotten into the low-priced six field has made a go of it, by any means. Five manufacturers had six-cylinder cars priced at less than $1000 in 1923. Of those five, only two, Essex and Oldsmobile, still have sixes for under a $1000. Two others, are selling in a slightly higher price class, while one, Columbia, is out of the automotive picture.

The manufacturers who today have sixes in both open and closed styles for less than a thousand are Ajax, Oldsmobile, Overland and Star. Essex concentrates practically altogether on closed model, as does Pontiac at the present time. Jewett has a closed six for under a thousand, but its open model is over that mark. Cleveland, on the other hand, has an open model just under $1000, but its cheapest closed car is $1090.

With its new Detroit delivered price of $790, Essex has set a new low level in cars powered with a six-cylinder engine. Its delivered price in Detroit now stands $35 under the F. O. B. rate of the next lowest priced closed six. This latest cut is of interest, not merely for its immediate competitive significant but because of the speculation which it has aroused at to future merchandising trends in the low-priced six-cylinder field.

It was said a while back that the Ford idea of standardization and quantity production still must be considered as an experiment until Ford had found it necessary and possible to bring out an entirely new car and build it and sell it for a price as low as that asked for the present vehicle. Is it possible that the lowest priced automotive vehicle of the future may be a six? Will it ever be possible to bring down the cost of producing and selling a six to as low levels as have been reached by the cheaper fours? Can the process of price reduction through increased quantity go as far in the six-cylinder line as it has in the Ford case with the four, or will the point at which added production brings only negligible cost decreases be reached sooner in the case of the six?

Still Lower Prices Possible

These are questions which only the future can answer, but the rapidity of developments in the low-priced six field in the last two years would indicate that there is at least a possibility of considerably more reduction in six-cylinder prices before the minimum is reached by those companies which are basing their bid for success largely on quantity and low price. This speculation refers only to general economic considerations, of course, and has no relation to any immediate competitive situation.

It will be interesting to consider for a moment the relationship of six-cylinder output during the past few years to total car production during the same period. At the end of 1925, about 66 per cent of all American passenger car models carried six-cylinder engines. This was not the high point, so far as percentage of total models is concerned, however, as about 71 per cent of all the car models had six-cylinder engines in 1924. Consequently the increased production of low-priced sixes has come about during a period when the proportion of sixes as a whole on a model basis was declining slightly.

The United States has been much more active in the development of sixes than have the British. Last figures show that only 22 per cent of British models today have six-cylinder engines as against the 66 per cent in this country as just noted. An overwhelming proportion of British models carry four-cylinder engines, the percentage of the total being 73. The other five per cent of British models have eight-cylinder powerplants.

It used to be that car prices varied almost directly with the number of cylinders. Sixes cost more than fours, eights cost more than sixes. No longer is that the case, except in a most general way. Prices of fours and sixes overlap materially today and seem likely to overlap more as time goes on. The six-cylinder car today is very definitely in the low-priced market and will continue to intensify competition in that field for some years to come.

1926 Report on Civil Aviation

THE 1926 report by the Joint Committee on Civil Aviation of the U. S. Department of Commerce and the American Engineering Council, which has been published in book form by McGraw-Hill, under the title of "Civil Aviation," contains an excellent summary of the development of commercial flying both in the United States and in the major foreign countries. The first chapter contains an itemized list of the findings which have been made by the committee, together with recommendations to Congress, the several states of the Union, the President, the various Government Departments, as well as Underwriters, Life and Accident Insurance Companies, and other commercial enterprises connected in any way with commercial aviation, as to the best procedure to be followed at this time. In order that commercial aviation may be established on a sound basis.

Subsequent chapters analyze air transportation conditions all over the world with a summary of the chief developments made in the various countries considered. The progress in aircraft reliability and safety in various countries is pointed out in detail. Geographic and traffic conditions as influencing air transportation, indicating a method by which the possible future for any given air line in a section may be determined, are covered in chapter five, and are supplemented by chapter six which goes into the possible, probable and actual application of the airplane to other industrial uses outside of passenger and freight transportation.

The committee, after summarizing the extent of government control over civil air navigation in foreign countries, recommends that a regulatory body be set up in this country with clearly defined general powers to control flying. Government encouragement and assistance in urged.

Worm Gear Drive Re-entering American Passenger Car Practice

Chief advantage offered is possibility of lowering center of gravity. Is used on British cars of all price classes and has proved both efficient and durable.

By Walter L. Carver

AFTER a lapse of more than ten years, the worm drive again is becoming an active factor in the considerations of American passenger car designers. In the first attempts in this direction, made about 1912, the desirable feature was silence, as passenger car engineering had reached the end of its tether with the old straight-toothed bevel gear. However, the advent of the spiral bevel gear, plus some unfortunate experience with the worm gear of that day, cast a shadow over what was otherwise an attractive mechanical device.

As has been stated, quiet operation was the criterion of 1912. Since that time, two or three other factors have entered into the consideration of general design. The four-wheel braking system is established rather firmly. Engines have become more powerful per unit of weight and much more flexible. As the result of these two influences, speed again is returning to the limelight of importance. This statement can be checked by a resume of the recent shows. On every hand, speed was discussed freely and at least two new models are credited with a maximum speed of 80 m.p.h. Even the lowest priced cars are capable of 50 m.p.h. or more, and 60 and 70 m.p.h. are obtainable in the medium price class. In order to be effective, this speed must be obtained readily and an equivalent ability to decelerate must be present. All of which is analogous to the modern railroad and the adoption of the air brake.

Center of Gravity Important

At this point the analogy ends. Car designers have been aware of still another element which constituted a hindrance to the most desirable performance. The passenger car does not operate on a smooth track or long curves. Consequently the height of the center of gravity becomes an important factor if the last word in performance and comfort is to be obtained. The limitations of the bevel type axle are well known. In a sense they have been responsible for the reduction of about 4 in. in average tire diameters in recent years. This reduction brought the center of gravity down about 2 in. but the propeller shaft with its rear end in plane with the axis of the axle set up an insurmountable barrier to any further reduction. With a straight line drive the limitations were definite and any further reduction in frame height had no effect on floor board and body height.

Aside from the mechanical angle, the style tendency, or American esthetic opinion, has been in the direction of cars of lower, racier appearance. To meet this demand, some car manufacturers turned out bodies with inadequate head room inside of the body. Now the quest has turned in the direction of the undermounted worm drive, not so much for the drive itself as for the advantages which can be built around it. In the case of the Stutz vertical eight, which has a Timken worm driven axle, the rear end of the propeller shaft is about 5 in. below the center of the rear axle and in conjunction with a straight line drive from the front of the engine to the under-driven worm, the rear end of the gear box is lowered about 2 in. Consequently the top line of the frame, which determines the height of the floor boards is only 18 in. above the ground. This figure is substantially less than customary practice for cars of the same weight and tire requirements.

Used on Commercial Cars

Meanwhile the worm drive has found wide application in the bus, truck and tractor fields to the complete denial of the old opinion that the worm drive is a nice device for light loads and intermittent service. Bus service may be properly regarded as super-passenger car service. Noise is equally, if not more objectionable and economy of operation and maintenance is far more important. Bus service also requires speed which is not at all inconsistent with passenger car requirements. In fact many bus manufacturers feel that the bus must be made just as fast as the passenger car so that highways will not be choked and an unfavorable attitude toward this new form of transportation developed.

Evidence derived from these three fields has made a good case for the worm drive and need not be amplified at this point. It remained necessary to introduce evidence which was directly pertinent to the operation of the worm drive in the passenger car field. To this end, recognized manufacturers of the worm drive have sent representatives to England to investigate opinion and experience there. Contrary to engineering opinion in this country, the worm and gear combination has been used freely there and is regarded as an established piece of mechanism which can be used to good advantage at the option of the individual designer. The high spots of one of these investigations, which was made by representatives of the Cleveland Worm and Gear Co., one of the pioneers in the production of the worm drive in this country, constitute the next portion of this article. Unless qualified, all remarks will pertain to the use of the worm drive in passenger cars.

Sponsored by Lanchester

Probably the outstanding sponsor of the worm drive among British manufacturers is Lanchester, whose name also is identified with the harmonic balancer, vibration dampener and a considerable number of other automotive inventions. Since the first one produced in 1898, every car bearing his name has been equipped with worm drive. Many of the earlier cars are still in service but long experience and observation have demonstrated that the original worm and gear outwear the remainder of the vehicle.

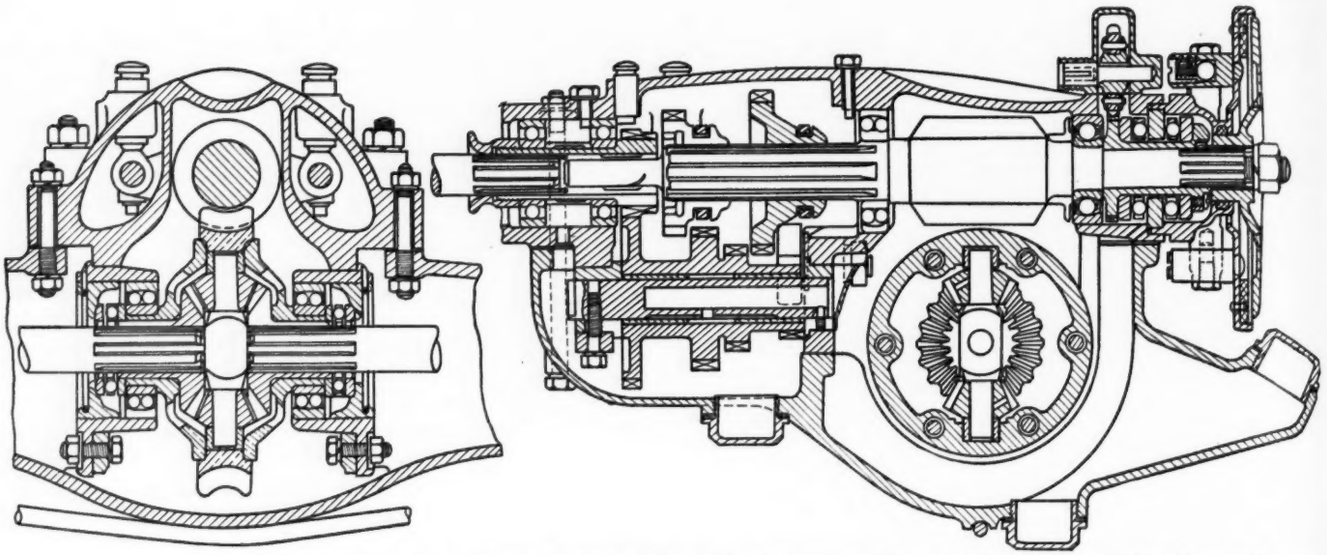


Fig. 1. Typical overdriven worm type rear axle which incorporates the gearbox that is fairly common British practice

In about 28 years' experience only two sets of these gears have been returned by reason of defects within the worm combination.

When the American visitors arrived in Birmingham, they were met at the hotel by a car which was remarkable for its silence and general fine performance. Comment brought out the fact that, although the body had been changed to conform to modern ideas, the chassis was built in 1906 and the original worm and gear were still in place after well over 200,000 miles of service.

Daimler, which with Lanchester is well up in the English price scale, uses a worm drive built under Lanchester patents in six models, all having six-cylinder engines. However, the drives for these axles, as well as those for the two Lanchester sixes, comprise the hour-glass type of worm known commonly in this country as the Hindley type. This type of gear is not amenable to American production methods as the worm cannot be ground readily. In the practice of the two plants mentioned a single machine is used for cutting both the worm and the gear, running for a time on one part and then being shifted to the other.

As the tooth form of the hour-glass worm is undercut, grinding is impracticable and is supplanted in the British production scheme by hand lapping, fitting and running-in. Nevertheless this combination, although produced in a routine which does not conform to the American idea of good manufacturing practice, has been a pronounced success from the angles of operation and maintenance. Both concerns state that the serivce expense of the worm drive is practically nil, except in the case of accidents. Both state that in the ordinary course of operation the worm drive will outwear the rest of the car and retain absolute silence insofar as gear noise is concerned for the entire period.

Reference to the tabulation of worm driven English cars will show that both Daimler and Lanchester build cars which are equipped with engines of greater displacement than all but three or four American cars. The same tabulation taken from the files of *Automotive Industries* demonstrates that the worm drive is used in several other makes, down to almost the smallest sizes built there. Some of these are priced around $1000, which in England is the equivalent of our low-priced quantity production class.

The possibility of reducing the height of the chassis is apparently a minor factor, as in many cases the worm shaft is located above the center of the axle. A. C. for example, manufacturing what would be regarded here as a sport car, as related to both four and six, one model of the latter being guaranteed to do 85 m.p.h., locates the worm above the gear. All Daimler models have the worm below the gear, as have several others. The free use of the worm in either position confirms the idea that this form of drive is regarded as a thoroughly creditable piece of mechanism which is to be used at the will of the designer.

Another striking thought which is brought out by this table is the fact that the worm drive is used in cars ranging from the most powerful and expensive down to those of almost the smallest power rating, with a price which is based upon economy of investment and operation. At present, two British cars are rated at 7 hp. and one at 8 hp. Three cars are rated at 9 hp. and one of these is equipped with worm drive. Also, it will be seen that the worm drive is used liberally in cars having a rating just above these figures. One engineer has explained the broad use of the worm drive as follows: "The worm drive is of

Worm-Driven English Cars

Name	Rate hp.	No. cyl.	Bore in.	Stroke in.	Tire Size Dia.	Tire Size Section
A. C.	12	4	2.7	3.9	27	4.4
A. C.	16	6	2.55	3.9	28	4.95
Briton	10	4	2.5	4.3	28	3.5
B. S. A.	16	6	2.55	3.7	31	5.25
Daimler	16	6	2.55	3.7	31	5.25
Daimler	20	6	2.89	4.1	33	6.0
Daimler	25	6	3.2	4.5	33	6.0
Daimler	35	6	3.8	5.1	33	6.75
Daimler	30	6	3.8	5.1	37	7.3
Daimler	45	6	4.6	5.1	37	7.3
H. E.	14	4	2.9	4.7	32	4.0
Lanchester	21	6	3.1	4.5	32	4.5
Lanchester	40	6	4.0	5.0	33	5.0
Rover	9	4	2.3	3.7	27	4.4
Standard	11	4	2.6	3.5	27	4.4
Standard	12	4	2.9	4.3	28	4.95
Standard	14	4	2.9	4.3	31	5.25
Turner	14	4	2.9	4.75	32	4.0
Vulcan	12	4	2.7	3.9	28	4.95
Vulcan	12	4	2.7	4.75	28	4.95
Wolseley	11	4	2.55	3.7	28	4.95
Wolseley	16	4	3.1	5.1	31	5.25

a standard of quality which conforms to the most expensive cars and sufficiently cheap for cars in the lowest price range."

In connection with the use of the worm drive in light cars, two typical British installations are shown by Figs. 1 and 2, the first of which is an overdriven installation with the gear box on the rear axle assembly. This practice is fairly common in England with both worm and bevel driven axles which may be attributed to generally good road conditions there and the consequently lesser importance of unsprung weight. Similar design has been discarded in this country because American cars must continue to be designed to operate on relatively unimproved roads for some time to come. Also the manufacturing economy of this arrangement is questionable, and experience here has proved it to be undesirable.

Typical Underdriven Layout

Fig. 2 shows a typical British underdriven layout for a light car. In almost every worm-driven application, the bearing layouts follow the lines shown by these two illustrations. Only one maker uses taper roller bearings liberally. With annular bearings, radial loads are separated from thrust loads and the latter are taken by double thrust bearings. However, there is no apparent reason why American anti-friction bearing practice can not be applied to worm drive mountings and our bus and truck axle experience is an excellent guide in this connection.

In another British installation of which no illustration is available, some unusual liberties are taken with the bearing layout. The center bearings of the rear axle are placed on the live axle shafts and the differential assembly rides on the splined ends which overhang between these bearings. Although this car is one of the successful British cars and has a relatively wide distribution, this arrangement is not advocated by the manufacturers of worm gear sets.

As a general aixom it can be stated that the worm gear set is either very good or downright bad, with no middle ground of compromise. Granting that the theory of the tooth forms is understood and the gears are produced well, the important factors then are the dimensional and angular relationships of the two axes. If these are correct, the combination will be quiet permanantly, and the job of assembly and adjustment is one of minor importance as regards difficulty and time requirements. One British engineer stated that the worm drive is cheaper than the bevel when the whole job of assembling and adjusting the axle and getting the car ready for the road is considered.

As regards backlash, which is another of the traditional bugbears of the worm drive, English engineers have no complaint to make. In the first place, backlash, as judged from a set of gears on the drafting room table, with very light oil as lubricant, or none at all, is something entirely different from the backlash when the gears are in place and covered with the usual heavy lubricant. That backlash is present can not be denied nor can it be denied that it is thoroughly justified, but this element can not be gaged by the backlash of a cold unlubricated pair of gears.

As the gears are assembled originally, the backlash is not more than that of a good pair of bevel gears and when the correct lubricant is used it is practically imperceptible. With service, wear is bound to occur but this wear is relatively slow and does not interfere with the smooth, silent action of the gears, as the worm serves as a burnishing tool in developing new generated surfaces. British cars which were observed after long service do not show unpleasant backlash and the Lanchester six mentioned earlier in this article was examined carefully for this particular trouble, which did not show up.

On the whole, British material specifications agree with the practice here although straight carbon steel is used widely for the worm and American engineers are inclined to agree that this material is not as suitable as the S. A. E. 2315 steel, which is a 3½ per cent nickel carbonizing stock. Phosphor bronze is used almost exclusively for the gear, but this material is not held as uniformly as is our standard specification, nor have their foundries developed chilling methods which correspond to those in use here. Triple chilling, which is common in bronze ring gear practice, here, makes the material harder, tougher and reduces the coefficient of friction and therefore the temperature of operation.

Ground Clearance

Ground clearance is one of the factors which is related to the underdriven worm axle. Observation of worm-driven cars under various conditions has demonstrated that this objection is largely a mental one. Of the English worm-driven cars, the Vulcan is delivered in considerable

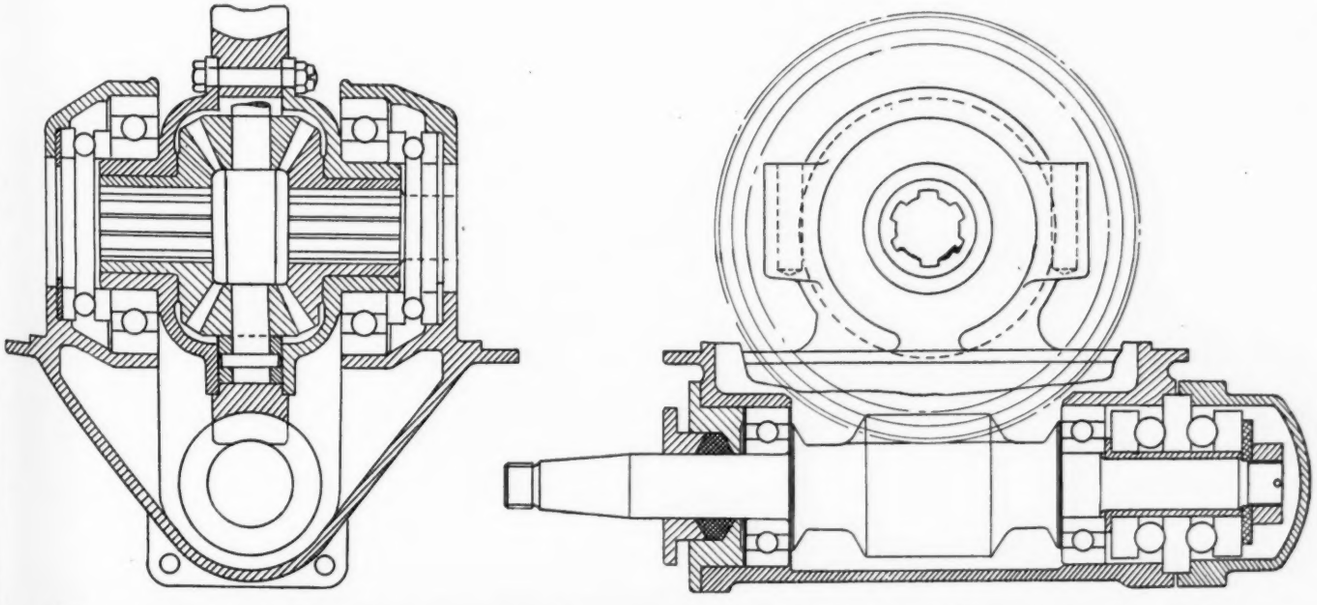


Fig. 2. Typical underdriven worm gear assembly. Bearing layouts in both assemblies are common practice

quantities to South Africa and Australia. Wolseley features cross country runs, one of the most recent having been from London to Constantinople with a woman driving, and according to her story, previous reports concerning the roads of the Balkens have not been exaggerated. It is pointed out that a clearance of 8 in. under the axle housing is not difficult to obtain with the worm drive and some of the British cars have as little as 6 in. clearance at the center. Reference to the table indicates that none of them have inordinate tire sizes, as the practice conforms rather closely to current sizes here.

14 Years' Experience

During 14 years' experience with the worm drive in both the automotive and industrial fields, the Cleveland Worm and Gear Co.'s organization has accumulated a considerable amount of information which throws numerous sidelights on the possibilities of this mechanism. One field of effort has been the production of worm drive reduction gears for use with steam turbines, a service which involves speeds and reductions that are directly comparable to those of automotive engineering although the torque is much higher. Speeds as high as 4000 r.p.m. are encountered at the worm shaft and gear ratios range between 5 and 10 to 1.

Under conditions of this sort, operating temperatures are normal at 120 deg. Fahr. or lower. Wear is very slow and it is stated that the wear here and in all worm gear applications is similar to that occurring between a ground shaft and a good bronze bushing. Under good lubrication conditions, the hardened steel member burnishes the bronze component, with little or no manifestation of abrasive wear.

In connection with reducing gears for general industrial service, eleven of twelve English concerns making these devices use the worm drive. One of the advantages of the worm drive for industrial and automotive service is the possibility of obtaining almost an infinite number of reductions on the same centers. In the stock at the Cleveland plant are gear sets made from the same blanks with reductions ranging between 6 and 60 to 1. The only difference in the gears is in the teeth. However, it must be remembered that reductions in this great range will not carry the same input capacity. As the reduction increases, the torque input must be decreased. Where the reduction is relatively small the teeth in both worm and gear are large but as the ratio increases the teeth become smaller.

Reversability Not Reduced

Automotive reductions probably will not exceed 7 or 8 to 1 for some time to come, and no trouble due to lack of reversability is experienced within this range, nor even with much higher reductions. By reversability is meant the ability to drive the mechanism from the gear shaft, as in the case of pushing a car around the garage floor.

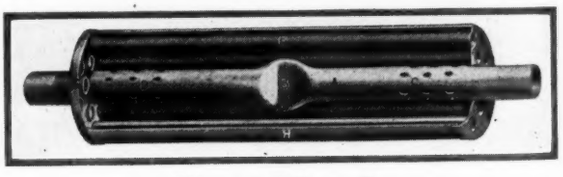
As to whether the worm shall be located above or below the gear, the choice is entirely with the individual designer. If the rotating speeds are high, the worm can be placed above, with assurance that lubrication will be adequate. In fact, many high speed reducing gears are arranged in this manner. The chief advantage of this arrangement is the simplification of the packing at the driven end of the worm. When the worm is placed below the gear this packing should be considered carefully, to prevent leakage of the lubricant. If a reverse thread is used to force the lubricant back into the housing, means must be provided to prevent carrying dirt back with the lubricant. Nothing is quite as fatal to the successful operation of the worm drive as dirt with its abrasive action.

No attempt has been made to present other than practical aspects of the worm drive in this article. It is not anticipated that this drive will supplant other forms completely, but judging from the enthusiasm for the subject which has been shown recently, broader application is to be expected. Manufacturers of the worm drive are anxious to eliminate the feeling of mystery and superstition which has surrounded this particular form of mechanism. While there are at least four schools of thought on the subject, each has its foundation of reason and can point to a background of experience in industrial as well as automotive applications which demonstrate that the device is thoroughly useful and reliable.

Engineers and designers who anticipate developing the use of the worm drive should beware of existing handbooks and textbooks on the subject. Just as steels and other automotive metals have made tremendous strides since 1912, so have the theory and practice of worm gearing. Existing printed information on the subject has not been amplified in that time and practically all of the available reference material is out of date. In fact, much of this material has been proved erroneous by those who specialize in the design and production of worm gears. In view of this condition, which is admitted by the author of one text book, it will be well to be guided by those who are recognized specialists in a particular field.

Muffler Has Cooling Tubes

A NEW muffler in which it is sought to reduce the volume of the exhaust gases and thus the noise consequent upon their discharge to the atmosphere, by effectively cooling them while they are still confined, has been developed by Hayes Dill, of Washington C.H., Ohio. As will be seen from the accompanying view, the muffler is of



View of Dill muffler

simple construction. It is of cylindrical form, and the exhaust gases enter it through a pipe extending axially through it, but which is closed up at the middle by flattening it, and has a number of small holes drilled through its wall at both ends.

The feature which distinguishes this muffler from most others is that it has a considerable number of tubes running through it from end to end, which are expanded into the headers. When the car is in motion, cool air flows through these tubes, so that their temperature will be kept near that of the atmosphere. The gases inside the muffler coming in contact with this extensive surface at a low temperature, give up much of their heat to it, with the result that their pressure is materially reduced. The hot gases enter the muffler through the pipe at one end and leave through the same pipe at the other end. The pipe is not entirely closed up at the middle, but merely restricted, and some exhaust gas passes through it.

Some tests on the Dill muffler were made by Prof. H. M. Jacklin at Ohio State University, who found that the back pressure was materially less and the horsepower somewhat greater, than with the muffler which came with the engine on which the tests were made.

THE right hand rule of the road was made compulsory in Jugo Slavia by a law which went into effect on November 30 last.

Just Among Ourselves

Big Forests Into Little Toothpicks Grow

IT'S a good thing that most of the big automotive banquets are over for the year. President Coolidge has just designated April 18-24 as the 1926 American Forest Week and issued a proclamation saying that as a nation we have been consuming our forest wealth too prodigally. Everybody knows what a banquet without toothpicks is and yet we've seen fellows break and throw away one toothpick after another when working on a piece of corn wedged between a back molar and a wisdom tooth. And aside from banquets, the automotive industry still continues to be a very large consumer of wood, because the greatly increased production of closed bodies in the last few years has added constantly to the automotive demand for wood, despite the introduction of much steel in certain constructions.

* * *

Original Parts Selling Methods Are Changing

IF original parts are to be used in replacement work, they must be widely distributed, moderately priced, and adequately merchandised. This is about the conclusion that seems to have been reached by a number of car manufacturers who have been studying the parts problem carefully for a long while. The idea that honest competition could be kept out of the field by calling it "pirate" has been largely dissipated. Several car manufacturers in the last few months have discarded all traditional limitations and rigidities of method in original parts distribution and have set out to get the replacement business by meeting competition on its own ground. Car executives themselves have criticized original parts distributing methods in the past on the ground that they do not cater to competitive dealer or repair shop business nor make any effort through discounts or solicitation to encourage this business. That criticism no longer can be leveled against all car factories. We are indeed in a time of changing channels of distribution.

* * *

Will Car Dealers Sell Airplanes in the Future?

WHEN the number of airplanes in use by private owners begins to reach into the thousands, when airplane service is needed at widespread points just as automobile service is needed today, who is going to sell the planes to the individual owners and who is going to provide the service? It seems quite likely that the automobile dealer may be the airplane dealer also. Several passenger car dealer organizations already have become local agents for airplane manufacturers and there is reason to believe that this trend, already begun, will continue in the future. No type of merchant now in business is better equipped to handle airplane sales and service than the automobile dealer. This is a development worth watching at any rate.

* * *

German Engineer Praises American Designs

PROF. DR. ENG. G. BECKER, Charlottenburg, in a paper read before the German Society of Automobile and Aircraft Engineers recently, reached the conclusion that the high performance characteristics of American automobiles are the reason for the technical and commercial successes of the Americans both at home and in European markets. The German product, he says, must move into a leading position with respect to performance characteristics if the German motor car is to get a strong position. This is a life question for the German automobile industry. In no case would a half-way attempt be made to take the necessary forward step, Dr. Becker states, for the end in the improvement of the performance characteristics has not yet been reached, and with half-way measures it is impossible to catch up with the leaders. The German automobile industry may well be proud of the success it has already attained, Dr. Becker says, in the reorganization of its production methods. At the present time cars in the 4,000 lb. class are being offered in the German market at a price of 5.70 marks per kilogram vehicle weight (62 cents per pound.) It is interesting to have these comments about American design come from a foreign engineer.

* * *

Another Highway Safety Conference

IT'S nearly time for the second National Conference on Street and Highway Safety. March 23-25 are the dates and Washington is the place. The meeting is under Herbert Hoover's auspices, as was the first one a year ago. At that first meeting the object was to establish sound principles upon which highway safety work might go forward. Probably much of the attention at the coming session will be devoted to drafting and approving a uniform traffic safety law which can be urged for adoption by all states. Vehicle commissioners from some forty states have been cooperating with the Conference committees in working up such a law and final revision and discussion is likely to take place at the meeting in Washington. Automotive executives naturally have been active in the work of the various committees of the conference and a good turnout of automotive representatives is expected at the meeting.—N. G. S.

Broke at 45, Christian Girl Second Automotive

Man who created and then lost control of old Standard Parts Co., $20,000,000 concern, again rises to prominence in accessory manufacturing field. Has had romantic business career.

By NORMAN G. SHIDLE

As a mail carrier, Christian Girl dreamed of business opportunities in steel and automobiles

REGARDLESS of business rivalries, personal animosities and differing economic judgments, there is a universal thrill in every "come-back." The beaten team which rallies to victory in the last quarter of the big game; the tiring runner who throws his last reserve power into a winning sprint; the French armies holding on the Marne and finally taking the offensive; all of these make a strong appeal to our emotions. The spirit that makes possible the old come-back in sport and war is of the same stuff as that from which the business success of the automotive industry itself has been shaped.

But in addition to mere admiration for successful achievement in the face of severe odds comes also an intelligent curiosity as to how the results were obtained. Why did this man suceed? Why did that one fail? How often did Lady Luck escort the struggler over rough spots in the road? How often did his own abilities see ways of avoiding obstacles or bring running to his aid loyal helpers to cut a way for him?

Few more interesting business careers have been molded in the automotive industry than that of Christian Girl, the Indiana farmer's son who built himself to the top of an outstanding automotive enterprise before he reached the age of forty, rendered able service to his government during war-time with very real detriment to his personal business affairs, found himself badly in debt at the age of forty-five, and built for himself a new organization which six years later, after a steady growth, earned net profits of $461,000.

Were a drama to be written about the business life of Christian Girl no better title could be found than by plaigarizing that of "The Man Who Came Back."

Nine years after the end of the Civil War, Christian Girl was born on a farm near Elkhart, Indiana. His parents were of Pennsylvania Dutch and German stock, so that the industry and pioneering courage which has characterized Mr. Girl's activities perhaps may have been expected since those same qualities have so often been common to those groups of early settlers and their descendents. Even the spirit of free-thinking and intellectual honesty which so many of his associates find in Mr. Girl might also be traced by those who believe strongly in hereditary influence to that maternal great-grandfather of his who fled from Germany in 1826 to escape religious persecution and settled in Indiana in 1828.

Went to Cleveland in 1895

However that may be, Christian Girl as a young man went through the usual life of a farm-bred boy, completing his formal education at Elkhart High School. Like many other farmers' sons, too, he left his rural surroundings after finishing school, going to Cleveland in 1895 where he did all sorts of odd jobs to earn a living for a year and a half.

Then he got a regular job—very regular. He became a mail carrier—before the habit of sending Christmas cards had become a disease, however—and continued in that capacity for eight years.

But instead of figuring out how to get a bill through Congress to get his pay raised, young Girl sought a more direct and individual road to success. He looked around for some chance to start in business for himself. He saw the already large proportions of the steel business and visualized in it further opportunities for future development. But he was interested also in this new means of transportation called the automobile. And he thought to himself, "What a great chance a fellow would have if he could get into something which would keep him in with both this big steel business and this new mode of transportation."

From that line of thought developed his first business venture—a spring repair and equipment business. He bought out a small garage and started in with a capital of $10,000, of which $8,000 was cash. Mr. Girl put $2,000 in himself, while $2000 more was advanced by his sister. He made money from the start, although his equipment business in the beginning was confined to making special springs for high-priced cars.

His first order from an automobile company came late

"Comes Back" to Success

In a little more than 10 years, Christion Girl built an $8000 investment into a $20,000,000 automotive parts business. Reverses came and he lost control, but today he is again a successful automotive accessory manufacturer. "Honesty," he says, "is the biggest single factor in making for successful operations of a business—mental honesty."

in 1906 when the Royal Motor Car Co. ordered 10 sets of springs from him.

From this meagre beginning he built the business of the Perfection Spring Co. to approximately $3,000,000 annually with an investment of $1,500,000. Then in 1916, he made the Perfection Spring Co. a part of a new corporation, the Standard Parts Co., a $20,000,000 enterprise, of which he became the president. Merged with Mr. Girl's original company, in the Standard Parts Co., were the Western Spring & Axle Co., the Standard Welding Co. and the Bock Bearing Co.

In 1917 Mr. Girl finally accepted an urgent call from Secretary of War Newton D. Baker to go to Washington as Director of the Truck Production Section of the Quartermaster General's Office. This time the government paid him less for his services than when he worked for it previously as a mail carrier. He became a dollar-a-year man and his job was to lay out a production plan for the manufacture of the Class B standardized truck and to get that truck into regular production. He did it.

Mr. Girl's personal business affairs suffered materially from his absence. Then later, in February 1920, came his forced resignation as president of the Standard Parts Co. The general facts of that change are known. To attempt to tell the whole story would be to bring up again a multitude of conflicting animosities which could serve no good purpose.

Friends Offer Financial Aid

Before Mr. Girl actually resigned from Standard Parts, but when it was evident that he might be forced out, financially strong friends, men who through all his troubles believed in him implicitly, already had given assurance that they would get behind him and finance any undertaking which he might start independently. In this group were included among others Arnold H. Goss, of Detroit; F. C. Finkenstaedt, of Bay City, Mich.; and Thomas Prosser, of New York City.

Deeply involved financially when he left the Standard Parts organization, Mr. Girl soon took advantage of this proffered aid and two months later, on April 26, 1920, headed a new company which purchased the Kalamazoo Spring & Axle Co. This resulted in the incorporation in August, 1920, of the C. G. Spring Co., which began to manufacture springs at the Kalamazoo plant.

Later the manufacture of bumpers was begun and later still, following a fire in March, 1923, which demolished the Kalamazoo plant, the company discontinued the manufacture of springs entirely. The name was changed to C. G. Spring & Bumper Co., its present form, in February 1924.

Mr. Girl's administration of Standard Parts was criticised in many ways by his opponents. Only one of those criticisms stung him deeply. He was accused of not being a capable manufacturer.

Speaking to *Automotive Industries* of that taunt which had been hurled at him six years ago, in his first statement of importance made for publication since that time, Mr. Girl said:

"The C. G. Spring & Bumper Co. is my answer to that criticism.

"We have made money every year, with the exception of the depression year of 1921. Our profits have grown steadily, the total of $460 934 net in 1925 being the highest yet reached.

"In 1924 we built about 400,000 bumpers. In 1925 our output totaled 700,000, and in 1926 we are practically assured of a production of 1,400,000, much of our increase being due to increased demand from car manufacturers."

Christian Girl's first automobile spring manufacturing and repair shop in Cleveland, Mr. Girl at extreme right. He started this business with an investment of $8000 and it was the beginning of an enterprise which grew into the $20,000,000 Standard Parts Co.

And study of further financial data about the company confirms Mr. Girl's statements as to its prosperity and indicates clearly that Christian Girl has "come back."

Today the company operates two unit factories, forging, finishing, assembling, etc., at Detroit and Chicago, with branches at New York and Cleveland.

In its first manufacturing year, 1922, the C. G. Spring & Bumper Co. earned $120,000 net. In 1923 its net earnings increased to $306,000, dropped to $176,496 in 1924 and jumped to the new high mark of $460,934 in 1925.

Earnings per share of common increased from $1.05 in 1924 to $3.03 in 1925. The company has outstanding 53,795 shares of 8 per cent preferred stock of $10 par value and 142,310 shares of no par common stock. On May 21, 1925, the funded debt of the company consisted of $122,000 real estate mortgages outstanding.

The current prosperity of the company is indicated by the fact that an extra dividend of 5c per share was declared on the common stock for the quarter ending Nov. 15, 1925, in addition to the regular dividend of 10c a share.

The healthy growth of the company is shown by the following table:

	Net Sales	Earnings	% Earnings on Sales
1922	$1,200,000	$120,000	10
1923	3,680,000	306,000	8.3
1924	3,550,219	176,496	4.5
1925	3,888,745	460,934	11.8

Now what about the man himself?

In appearance and manner, Christian Girl is pleasantly far from the high-powered, smashing, bombastic figure that our cartoonists have led us to picture as a Captain of Industry. Relatively small in stature, Mr. Girl speaks with a softness of voice which somehow seems to symbolize the tolerance of mind which it expresses. It is easy to understand where Mr. Girl gets his knowledge of men. Far from niggardly about giving out ideas and talking freely and fluently, he nevertheless seems always to encourage expression on the part of his companions; to put them at ease; to stimulate them to bring their share of thought as a contribution to mutual excange of ideas. He is tolerant—but positive—as was evidenced by his remark that Marshal Field was correct when he said "The customer is always right"—and added "when he is so terribly wrong that you can't call him right by any stretch of the imagination—then he isn't a man you want to do business with."

To this tolerance and mildness of manner is added a glow of energy which blazes momentarily when set off by some statement or idea calling for special emphasis or opposition. And through the whole personality of the man seem to shine the twin lights of kindliness and courage.

Again the head of a successful manufacturing organization, he has surrounded himself with none of the trappings of business power, but he has brought under his banner many of the younger men who formerly were associated with him. The furnishings of his office are of oak; the little reception room of his plant is just a place in which to pause; and it's difficult for the casual visitor to tell where the offices end and the factory begins.

Atmosphere of Friendliness

But from the moment the telephone operator at the reception desk smiles up at the incoming visitor to the time he passes into and out of the offce of the president, he moves in an atmosphere of welcome and friendliness that brings more comfort and ease than could be supplied by many thousands of dollars worth of expensive furnishings in themselves.

The story of Christian Girl is not the ordinary Plough-Boy-to-President hoopla familiar to the readers of the so-called inspirational magazines. In that Mr. Girl began as a relatively poor boy and later built himself to financial success, his career may be said to have followed the beaten track of the usual success story. But after talking at length with Mr. Girl and with many men who have been associated with him at one time or another over a period of years, one important fact begins to impress itself:

Christian Girl apparently developed for himself a few principles for his personal philosophy and then spent the best years of his life trying to work them out in a practical business way; he did not make his success with whatever ethical tools he happened upon and then later develop a rationalized personal philosophy to fit the results. Whatever may be thought of his abilities in general, it seems to be universally agreed among those who know him that he consistently tries to develop operations from principles.

This is not to say that he has worked out any set of written rules within the scope of which he tries to force

the actions of himself and those with whom he comes in contact. His normally quiet, tolerant personality is enough to belie any such interpretation. It does mean, however, that he has to a considerable degree that quality so often found in successful executives and so often lacking in unsuccessful ones of thinking and analyzing in the abstract as well as in connection with specific instances. These characteristics were apparent many times in the interview.

"Honesty is the biggest single factor in making for successful operation of a business," Mr. Girl said in answer to a query. Then he added hastily, "Oh, I don't mean just honesty in the sense of refraining from telling lies to your customers or your associates, or in refraining from stealing pennies out of the till. That sort of thing is essential, of course, but most business men are honest in that sense. Honesty has to go a lot further than that. Mental honesty—that's what I'm thinking of chiefly.

Too Little Attention to Facts

"Too many men in business let their desires govern their actions and pay too little attention to facts. Look over many company conferences. Watch the various men in them. A good many of them are busy thinking of what they ought to say to make the best impression on the rest of the group or trying to figure out what the boss's opinion is so that they can 'Yes, Yes' him quicker than anybody else instead of trying to find out the answer to the problem. That isn't mental honesty. We'd save a lot of waste in business if more executives had the courage to be mentally honest—to seek Truth, however unpleasant it may seem for the moment.

"And take your big, prominent men—think of the responsibility and opportunity they have to get people thinking." Mr. Girl paused for a moment. Then—"I think Henry Ford is one of the greatest thought stimulators in the country. He does an immense amount of good because he starts people to thinking. Being an important national figure, his opinions take on a nation-wide interest. When he says something, hundreds of thousands of people talk about it. And he constantly is making statements about things that set people thinking. It doesn't matter how much one may disagree with him in any particular case. The result of his activities is to stir up thought—and that's a useful function. Am I right?

"Every chief executive occupies a similar position in relation to his own organization," Mr. Girl continued. "He may be throwing out ideas constantly which start his subordinates to thinking. If he is mentally honest he will encourage his associates to be mentally honest also. Discussions will be frank, sincere and constructive—even though heated at times. In any case, the chief executive usually sets the model for his organization and its relations with outside contacts.

"You know," Mr. Girl went on musingly, "a double standard in business isn't any more practicable than a double standard in personal morals. A chief executive can assure ethical, courteous and fair treatment to his customers only by operating on exactly the same basis within his own organization. If a company is operated internally on a nagging, barking basis, its representatives sooner or later reflect that attitude in their relations with outsiders. It can't be helped. If a principle of operation is sound for relations with outsiders, it's sound for operations within the organization.

"Certainly there's nothing specially profound about that idea, but it's worth repeating because it doesn't seem to be clearly recognized everywhere.

"Only the other day, for instance, I was talking to a friend somewhat along these same lines. He asked me 'Don't you find it hard to get these ideals of yours carried out in practice by the many individuals which make up your organization? The theory sounds good, but the difficult part as I see it is to get several hundred men to carry it out.'

"That was an easy one." Mr. Girl smiled. "Easiest thing in the world. All you have to do is to carry through every single one of your internal operations on the same basis of fair dealing, honesty and frankness that you expect to have shown to your customers. Am I right?"

Men. Men. Men. No one could talk long with Mr. Girl about business problems without sensing the fact that his understanding of human desires and reactions plays an important part in his activities. He tends to see business, operating problems and manufacturing questions basically in terms of men—and for that reason often gets to the root of a problem much more quickly than if he sat on a high mountain of executive dignity and consulted only the statistical seers for data upon which to make decisions.

And his associates will tell you— each one privately and confidentially—that this ability to understand men and to stimulate them to thought and loyalty is "The thing that makes all the boys work like hell for the Chief."

New Type Observation Coach

A PARLOR observation coach for sight-seers has been built and is operated by the Pacific Northwest Traction Company, from which passengers may have an unobstructed view in all directions from a raised cupola at the rear. The coach runs from Seattle to Everett, and is one of four to be placed in operation in the near future.

The body is built of sheet steel over wood framing and mounted on a Fageol Safety Coach chassis, powered by a six-cylinder Fageol-Hall-Scott engine and equipped with air brakes. The lower deck has a seating capacity for 15 passengers, while the observation cupola, elevated five feet, accommodates 12. The space below the floor of the

New parlor observation coach

cupola, used for storing hand baggage and packages of the passengers, is accessible from doors on the outside of the body. This is the first coach of its type in the United States.

A DEPARTMENT of oil engineering and refining has been established at the University of Birmingham, England, and will be housed in a new building containing students and research laboratories, a lecture room, a drafting room and a museum. A small refining plant, similar to that found in the experimental laboratories of refineries, has been provided, so that the whole process from the production of the oil to the refining of the finished product can be carried out on a small scale exactly as in the industry. It is expected shortly to commence investigations as to the practicability of extracting oil from coal.

General Motors Prepared to Vary Production Every 10 Days

Any shift in retail market condition results in immediate speeding up or slowing down of factory operations, as occasion requires. How prices are fixed.

ALL production schedules of manufacturing divisions of General Motors Corporation are based almost entirely upon the ability of wholesale and retail outlets to sell the products to the public. To accomplish this, detailed reports are received from all dealers at ten-day intervals which contain complete information regarding deliveries, orders and stocks. These reports are then compared with productive schedules to determine if any changes are necessary.

Although monthly schedules are thus closely related to sales, long-time operation forecasts are based on the determination of a desirable rate of return on the capital investment, and the normal average rate of production—these two items being employed in determining a standard price for the product.

Albert Bradley, assistant treasurer, General Motors Corporation, read a paper before a recent meeting of the American Management Association in which he related in considerable detail the methods employed by that organization to determine fundamental price and production policies and to resolve these policies into actual production schedules which would provide profitable operation and would be closely allied to sales demand.

Following is an abstract of Mr. Bradley's paper:

The average long time rate of return on investment is the basis of General Motors policy in regard to pricing its products and this in turn is predicated to a large extent upon the normal average rate of plant operations. The rate of operation is influenced by several factors, such as general business conditions; policy regarding seasonal accumulation of cars or their component parts in order to level the production curve; the necessity and desirability of maintaining excess plant capacity, and similar items.

Ratio is Determined

A ratio between assumed normal rate of plant operation and practical capacity which represents, so far as is practicable, the normal economic situation within the industry, is determined and the assumed normal production rate is designated as the Standard Volume. This Standard Volume considered in relation to the rate of return on investment which is believed to be possible determines the Standard Price, which is the price of any product which will make the desired return when produced at the standard production rate.

This Standard Price is not necessarily the prevailing price and, in fact, the two seldom are the same. Determination of the Standard Price, however, does provide a standard with which actual prices may be compared so that the possibility of pricing either an entire line or certain models in a manner inconsistent with the fundamental price policy in the matter of return on investment may be avoided; and by means of the Standard Price the entire policy is submitted to the test of experience, so that, if over a long period of time actual prices do not approximate Standard Prices, the policy may be modified.

In covering each year's forecast of operations, each division of the General Motors Corporation submits a so-called Price Study which contains the division's estimate of sales in units and in costs, profits, capital requirements and return on investment. These estimates are made both for operation at Standard Volume and at the forecast rate of production for the following sales year, and all are based on the proposed prices.

The Price Study, in addition to furnishing an annual forecast, develops the Standard Price of each product which, when compared with the Standard Prices which represent the corporation's fundamental policy, indicate the departures from this policy which are necessitated by competitive conditions and other factors.

Establishment of Standards

This method of anlysis requires the establishment of standards of capital requirements and expenses factors, representing normal operating conditions, in terms of their ratio to sales or production costs.

The various standards which have been determined are:

The rate of capital turnover, which, when multiplied by the margin of profit, determines the rate of capital return;

The fiixed investment ratio, which is readily obtained once standard volume and standard costs have been determined;

Production costs per unit, some of which, of course are directly variable with the rate of production, while some have no relation to production and others vary in different degree with operating activity;

Commercial costs, which contain the same type of items as are present in production costs and for which standard costs based on standard volume are determined.

With all these various standards established—volume, rate of return on investment, operating and selling costs based on standard volume, and standard price—a means is afforded of judging the departures from normal caused by competitive or other factors. Actual production, costs, prices and profits, when compared with the standards, provide valuable information for evaluating past operation and determining future policies.

In using the forecasting scheme as a means of current operating control there are four factors which must be considered: Normal growth, seasonal variation, general business conditions, and competition.

Growth has been an important item in the past because

of the very rapid development of the automotive industry. For the future, however, it is believed that the period of tremendous annual increases has passed and that further growth will be based mainly upon normal increase in population and wealth of this country and development of export markets.

General business conditions and competition are important factors affecting the demand for General Motors products but they must be dealt with throughout the year as their relative influence varies.

Seasonal variation in sales of automotive products continues to be of considerable importance in spite of the increased use of closed cars and the year-round operation of a large proportion of all motor vehicles. This strong tendency of the public to buy new cars during the spring months means that production schedules must fluctuate widely throughout the year or cars must be produced in advance of demand and stored for varying periods of time.

In Table 1 is given an analysis of the seasonal fluctuations of General Motors sales based on the experience of the last three years. The figures denote the percentage of the total annual sales which are sold during each month. If sales were evenly distributed throughout the year, each month's proportion of the total would be 8.3 percent. Instead of this ideal condition, however, sales during April average twice this amount while January sales are only one-half with other months showing considerable variation from the normal expectancy.

Two Objections Arise

If this problem is solved by adjusting production to correspond closely with sales two major objections arise. Productive capacity required to take care of April's sales, for example, would be twice that needed if production were evenly distributed throughout the year, thus increasing capital investment, depreciation, taxes, and similar items and making necessary much larger earnings in order to provide an equivalent return on the investment. Labor offers a second objection to this course for not only are workmen entitled to steady employment which might be impossible with such wide flunctuations in output, but it is unlikely that the necessary amount of labor would be available when needed for peak production and it is certain that a factory operating under such conditions would be hard pressed to keep its skilled workers, so that the quality of the product might suffer.

Flattening out the rate of production and building up stocks of cars against future heavy demand also has its drawbacks. Such storage requires additional capital with its interest charge, greater insurance expense and similar items. If sales do not come up to expectation the cost of carrying stocks may be unduly increased through prolonging the storage period and further losses may result from the necessity of forced selling of the excess stock.

In actual practice a compromise is made between these two diametrically opposed conditions. General Motors factories vary their production schedules within the three limits established by: Plant capacity, accumulation of stocks desirable under current retail demand and seasonal demands, and maintenance of steady rates of operation of the productive facilities.

The original estimate of the yearly domestic sales volume is based upon an estimate of the number of cars which are likely to be sold by the entire industry segregated into three general price groups. The sales expectation of each division is determined by considering the estimated total amount of business to be available in its price group and the competitive situation in that price class, as well as general business conditions, the probable effect of new models, price reductions and similar factors, not only for General Motors products but for those of competitors.

Table 1

Percentage Distribution by Months of Annual General Motors Sales

January	4.2%
February	5.2%
March	10.2%
April	16.0%
May	11.3%
June	9.5%
July	8.3%
August	8.0%
September	8.1%
October	8.0%
November	5.9%
December	5.5%
	100.0%

The procedure outlined so far is not greatly different from that followed for the past six years. A distinct innovation in the procedure, however, is the development of a method which insures a change in a division's production schedule the moment actual experience indicates a change in the trend of retail deliveries to the public.

The first and controlling principle in the establishment of General Motors' production schedules is that they shall be based absolutely upon the ability of its distributors and dealers to sell cars to the public. To accomplish this each car division receives from its dealers every 10 days a report giving the number of new cars delivered to customers, the number of new orders taken, total orders on hand, and the number of new and used cars on hand.

As these reports are received they are compared with the month's forecast to detrmine if conditions warrant a change in the production schedule. In this way schedules may be increased or decreased at 10-day intervals so that output always bears the desired relation to actual sales.

With production properly controlled the corporation's system of inventory and purchase control keeps these two items in line with the production schedule. Each operating division submits monthly a definite forecast of the operations of the current month and of the three succeeding months. This report covers sales, production, investment in inventories and other items of working capital and outstanding purchase commitments.

These forecasts, unless the president takes exception to them, constitute the authority for each division to proceed upon the indicated manufacturing schedule and to make commitments up to the requirements of the forecast. Special authority is required before commitments can be made in excess of the indicated requirements.

Release of Materials

Upon adoption of the schedules, materials are usually released for the following month's production and for such parts of the succeeding months as require a long period for delivery or manufacture. About 95 per cent of the material purchases for the entire car, covering all major items, are released item by item, in accordance with the time they will be required in production and the time which must elapse between placing the order and the arrival of the material in the plant.

From a current operating standpoint a balanced inventory does not represent a quantity of materials which could be made up into a certain number of cars with no materials left over, but rather represents the number of the different items of material which must either be on hand or on order, scheduled for delivery at a certain time, to permit manufacture at the desired rate of output.

Releasing materials as they are actually required, in this way, makes it possible to reflect with minimum delay any changes which become necessary in the production schedule. In other words, to the extent that commitments have not been made and inventories accumulated beyond immediate requirements there exists a slack to take up subsequent changes in the schedule without piling up inventories or defering deliveries already contracted for. This procedure works to the advantage of suppliers as well as General Motors.

Results of this forecasting program have been many and valuable. Fixing cost expense and investment standards has provided means by which actual operations can be considered in relation to the fundamental policies of the Corporation and has also permitted these policies to be put to the test of actual experience for the purpose of evaluating their worth.

Marked increase in the accuracy of forecasting future operations has resulted, which is particularly desirable in an organization of the complexity of General Motors. Changes in production schedules have been much less violent than before and this has resulted in numerous operating economies. For example, turnover of total inventories for 1925 was 6.3, representing an increase of 33 per cent over 1923, the best previous year. Turnover of productive inventory reached 10.6 during 1925, a 50 per cent increase over 1923.

Steadier employment of workmen has resulted. During 1925 the maximum numbers of employees was 93,824, the average 83,278, and the minimum 68,085. Thus the maximum varied only 11 per cent and the minimum only 18 per cent from the average, which is by far the best record in the history of the corporation.

France Honors Father of Science of Thermo-Dynamics

IN France there was recently celebrated the centenary of the publication of a little book which is regarded as having marked the beginning of the science of thermo-dynamics. The author was N. L. S. Carnot, and the book, a volume of 118 pages, bore the quaint title (literal translation): "Reflexions on the Motive Power of Fire and on Machines Suitable for Developing This Power." The celebration was held at the headquarters of the Society of Civil Engineers and was presided over by the President of the French Republic. Addresses were made by two of France's most noted living scientists, Daniel Berthelot and Henry Le Chatelier.

In order to properly estimate the importance of the new theories propounded in Carnot's work it must be considered that at the time it was published the real nature of heat was as yet unknown. Most scientists still held the view that heat was a material thing, of the nature of a fluid, which filled the pores or interstices of all material bodies, and which in scientific writings of the period was generally referred to as caloric.

Carnot is credited with having introduced the conception of a cycle into reasonings on the operation of heat engines. The type of heat engine which he and his contemporaries writing on heat engines had chiefly in mind was the steam engine, because the gas engine was not a practical machine at that time. With any heat engine we take a certain working fluid, which originally is at atmospheric temperature, impart heat to it and thereby raise its temperature and pressure, and we then allow it to expand in a cylinder behind a piston, where, in doing mechanical work on the piston, the fluid expands, and it is finally discharged from the cylinder and returns to atmospheric pressure and temperature, which completes the cycle.

Carnot is best known to students of thermo-dynamics as the originator of the Carnot cycle. This cycle consists in compressing the working fluid in two stages, the first iso-thermal (compression at constant temperature) and the second adiabatic (compression without gain or loss of heat from or to the outside). Next the fluid was to be expanded in two stages, first iso-thermally and then adiabatically. Carnot showed that if this cycle were employed in a heat engine the highest possible thermal efficiency would be obtained. He also put forth the proposition, now one of the fundamental laws of thermo-dynamics, that the efficiency of the cycle is equal to the quotient of the difference between the heat supplied and the heat rejected to the heat supplied.

It appears that Carnot's book was issued in a very small edition, and it passed practically unnoticed at the time of its appearance. One of the reasons for this may have been that it was rather advanced for its period. This was the only work published by its author, who was only 28 years old at the time and who died eight years later in an epidemic of cholera, in consequence of which most of his papers were destroyed.

Attention was first called to the importance of Carnot's work by Clapeyron, who several years later conceived of a graphical form for representing the Carnot cycle, the familiar theoretical cylinder diagram consisting of two iso-thermal and two adiabatic curves. It was, however, more than 20 years later when the great development of the science of thermo-dynamics was started by such men as Sir William Thomson, Clausius and Joule, that the work of Carnot received full recognition. Sir William Thomson, who was studying at the laboratory of Regnault in Paris, learned of this work through the reference to it in a paper by Clapeyron in the Journal of the Ecole Polytechnique, and he tried to get hold of a copy of it, but found that not even the College de France possessed a copy.

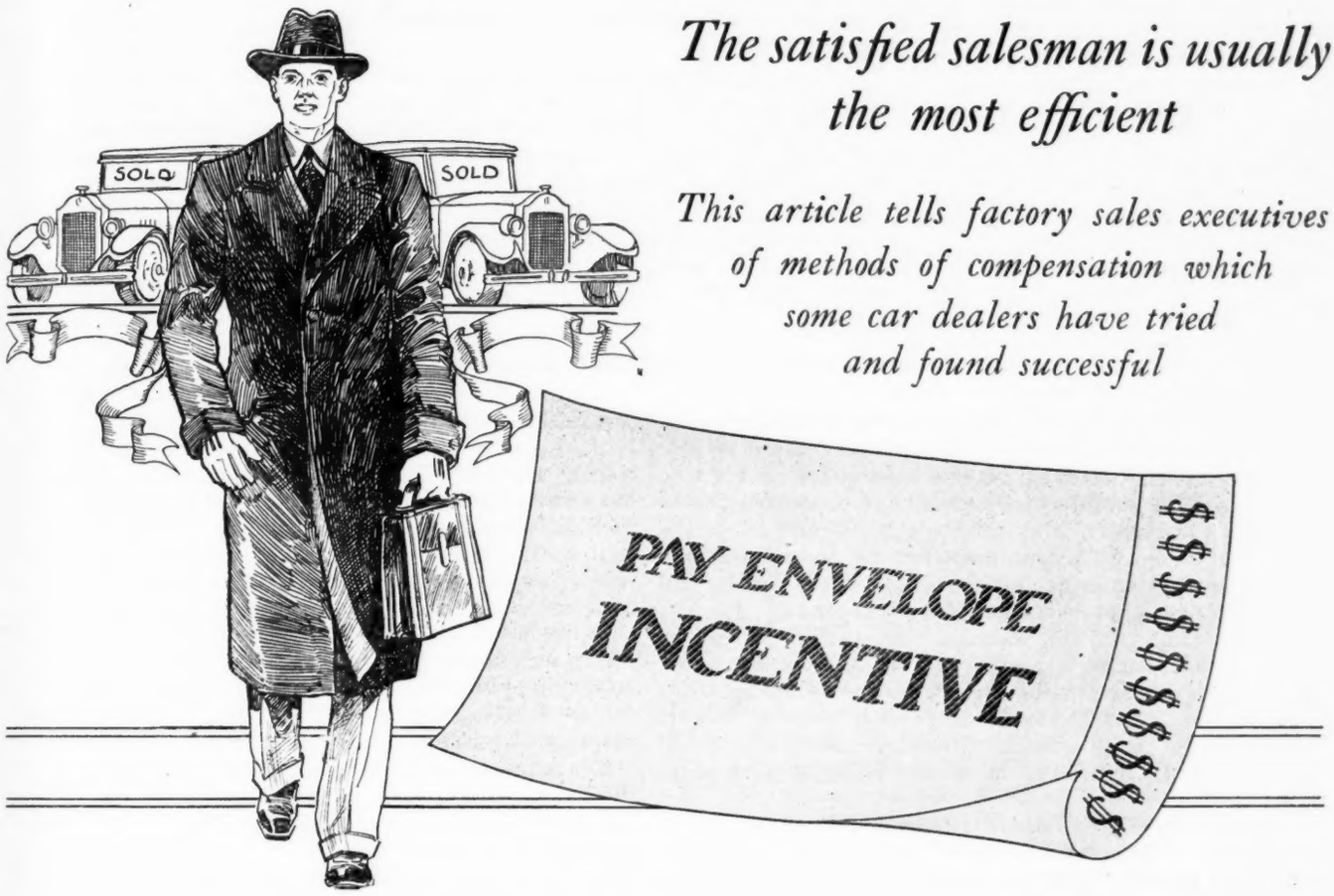
As to the high scientific value of the work of Carnot, perhaps no better authority could be found than Sir William Thomson, who in a paper printed in 1848 in the Transactions of the Edinburgh Royal Society said that from the deductions of Carnot it appeared that "if the value of *mu* for any temperature was known, certain information might be derived with reference to the saturated vapor of any liquid whatever, and, with reference to any gaseous mass, without the necessity of experimenting upon the specific medium considered."

Carnot did not express his relation for the thermal efficiency in the now familiar form $(T - t)/T$, because at that time the conception of the absolute zero temperature did not as yet exist. The absolute scale of temperatures was originated only some 25 years later, by Sir William Thomson, whose paper on the subject in the Philosophical Magazine of October, 1848, was entitled: "On an Absolute Thermometric Scale Founded on Carnot's Theory of the Motive Power of Heat and Calculated from Regnault's Observations."

Putting Enthusiasm *and* Incentive *in the* Salesman's Pay Envelope

The satisfied salesman is usually the most efficient

This article tells factory sales executives of methods of compensation which some car dealers have tried and found successful



By Ralph Schrenkeisen

ONE of the most important factors—if not the most important—in the building of a successful sales organization is the faculty of keeping the individual salesman satisfied. A satisfied worker, whether he be a mechanic, bookkeeper or salesman, is always an asset to his employer. When that worker is a salesman, who is constantly the connecting link between the dealer and his prospects, the importance of keeping him satisfied is greatly increased.

The satisfied salesman will approach his prospects in a wholesome enthusiastic manner that cannot help but reflect the confidence he feels in the car he is selling and the company he is selling it for. His confidence and belief will permeate to the prospect and will result in greater volume for the dealer.

Of course, anything which increases dealer volume tends to increase factory volume and therefore this subject of satisfied retail salesmen becomes of interest to the factory sales executive, who is constantly studying ways and means of getting more units into the hands of the retail buyer through his distributor and dealer outlets.

There are various methods which have been resorted to by distributors and dealers in order to gain this much-needed satisfaction in the sales force. Expensive sales contest are continually being run, but it must be remembered that in a sales contest only a small proportion of the entrants emerge winners and they, therefore, are the only ones into whom satisfaction is infused by the event. Outings and other social attractions are given by some dealers as well as elaborate provision for the personal comfort of salesmen and their prospects while in the dealer's place of business.

It must be admitted that these all help to form a close-knit organization but they are costly expedients which may yield no immediate return to the dealer. It is through the salesmen's pay envelopes and commission checks that the dealer will find the most effective means of instilling satisfaction and ambition into his men. It is through this channel that he can build for them an incentive that will tend to keep them striving always to beat their own previous records, and so increase their income. Wherever an article is to be sold, the incentive to sell it in ever increasing volume must be kept alive within the sales force, for without that incentive their efforts will lag and the sales volume of the dealer will suffer.

After all, each man is in business for himself, whether he is on another man's payroll or not. The salesman is in the business of selling automobiles. What difference does it make whether the cars he sells belong to him or to someone else? In either instance he is selling them in

EVERY automobile factory sales executive today is a student of retail sales methods. He realizes that the retail salesman is finally responsible for getting the product of the factory into the hands of the consumer, and he is interested in plans which have been successfully developed by dealers and distributors to increase salesman efficiency.

The accompanying article discusses an important phase of this problem—how to keep retail salesmen satisfied; how to keep them eager, loyal and enthusiastic.

Recompense, of course, is a prime consideration in this connection, and Mr. Schrenkeisen describes several methods of payment which have brought the desired results when put to the test of actual practice.

order to make a living. When a man's business fails to bring him in a proper return, it is wisdom for him to turn his activities elsewhere. And when a salesman's position does not bring him in a reasonable living wage, it is only natural for him to seek other spheres.

In determining the ideal method of paying salesmen it must be remembered that nothing appeals to an earnest man as much as does the knowledge that the greater results he shows, the greater will be his income. It is discouraging for a salesman to see his efforts bringing no greater reward than goes to the man at the next desk whose efforts and results total but fifty per cent of his own. It robs him of the incentive to make each succeeding month and year of his life a better one than those preceding.

Let us first consider the straight commission basis. Provided the dealer will adjust the rate of commission he is willing to pay in accordance with the normal demand for the product he is handling, this method holds the desired incentive that will spur the salesmen on. An adjustment of the rate of commission is essential because it is very evident that a higher rate must necessarily be paid to men who are selling cars that have not yet reached a high point in public favor. Here sales occur at longer intervals and the salesman's income must be raised through a higher rate of commission being paid on each sale.

On the other hand, where hundreds of thousands of dollars have been spent in gigantic advertising appropriations that have built an enormous demand for a certain make of car, the rate of commission which the dealer must pay will be lower because the frequency of sales will build up the salesman's income.

However, in spite of this possible adjustment, the straight commission basis has never been in high favor among salesmen because of its uncertainty, due to many conditions to which the selling of automobiles is subject.

In almost all sections of the country there is still, although not as pronounced as it was in past years, a decline in sales during certain seasons; there are local conditions which sometimes have their bearing, such as labor strikes and poor harvests; or there may come the time when the factory will fall behind in deliveries. All of these things combine to affect the salesman who is selling on straight commission and tend to make his income spotty and unreliable. When these "slumps" occur a dangerous proportion of his time will be given over to personal financial worries and his sales results will suffer in consequence.

The straight salary basis has as its one big advantage its steadiness. But it lacks the incentive that is always present in plans where commission, in any of its varied forms, is employed. With a straight salary the salesman is assured of a steady income regardless of how spotty his market may become but he also knows in advance just what that income is to be and has little incentive to increase his volume, except that which prompts him to produce enough to hold his job and, perhaps. hope for a raise of salary. The lure of a large commission check as a reward for extra sales is lacking. There is nothing dangling before his eyes to goad him to greater efforts.

And there will come a time, at least once a year, when the normal increase in his volume will cause him to compare his salary with the amount of money he would have made on straight commission and he will then become dissatisfied, at least for the time being.

The average salesman who is worthy of the title is a bit of a gambler. He prefers to feel that if he sells twice as many cars this week as he did last week, he will receive twice as much money for his efforts. This incentive is lacking where a straight salary is paid and the salesman is too likely to feel that it is merely necessary for him to sell enough cars to persuade his employer to continue paying him his salary. Therefore, with no increased earnings in view, the man who sells a car on Monday or Tuesday is open to the temptation of enjoying himself for the remainder of the week, feeling that the first day or so has earned him his salary.

It would seem, then, that a combination of the straight salary and straight commission plans, in which the safeguards and steadiness of one are coupled with the incentive and earning possibilities of the other, would be the logical solution of the problem of paying salesmen.

The combination salary and commission basis has been the means, to a very great extent, of moulding these advantages into one plan. On this basis the salesman is assured of a steady income on one hand, while on the other he is also assured that his income will be increased in accordance with his efforts and results. The basis will be found to be the one which will carry the distributor or dealer further than any other in his attempt to build a satisfied sales force.

One of the big advantages of this combination plan to both the dealer and his salesmen is the fact that the salary leaves the salesmen's minds free of personal worries and allows them to concentrate their attention and effort to building their sales volume and increasing their commission checks. No salesman is one hundred per cent efficient if his mind is divided between his sales duties and some financial obligation that he is afraid he may not be able to meet. In this day of keen competition a salesman needs to reserve all of his mental abilities in order to successfully cope with the sales arguments his competitors are offering.

Certain variations, however, have been added to the combination salary and commission plan by distributors and dealers who, realizing that their sales volume is almost entirely dependent upon the incentive that they hold forth to their salesmen and the amount of satisfaction the salesmen derive from it, have endeavored to set up an additional monetary goal for them to work toward.

One distributor in a large Eastern city evolved a salary, commission, and bonus plan for his men to work on. He paid them a reasonable salary in order that they might enjoy a steady income which would relieve their minds of financial worries and allow them to concentrate upon their

sales efforts. In addition to this, he paid them two per cent commission on the actual amount of cash involved in each sale. Then, in order to assure them that they were not losing anything by not working on straight commission, he agreed that if their earnings on a salary and two per cent did not equal five per cent of their gross sales at the end of the year, they would receive the difference as a bonus.

In other words, if a salesman sold $100,000 worth of cars in one year and received $4500 in salary and commission for doing so, he was entitled to a bonus of $500, that being the difference between the salary and commission he had received, and five per cent of his gross sales.

This plan has two great advantages. In addition to giving the salesmen a steady income, it gives them two incentives, instead of one. First, the salesmen are spurred each month to make their commossion checks as large as possible and, second, there is always dangling before their eyes the vision of a large bonus check to be received at the end of the year. Regardless of whether it was the first or twelfth month of their fiscal year, the men on this sales force always had their bonuses in mind and were continually striving to reach a volume that would insure their receiving a fair sized check.

One of the conditions upon which the receipt of a bonus depended was that the salesman had to remain with the distributor for the full year before he became entitled to participate in it.

The distributor who used this plan found that it increased his sales volume, lowered his turnover of salesmen, and attracted a more desirable class of men to his organization.

A new England distributor has been equally successful with a variation of the plan in which he pays his salesmen a salary as the basis of their earnings. In addition to this he has given each man a monthly quota, based upon past records and what is expected of him in the future, above which he pays them a certain flat sum per car. This is an incentive which urges each man to strive for his quota in as short a period of time as is possible for he knows that it is upon the cars he sells above his quota that any increase in his earnings depends. The distributor has made his quotas reasonable so that it is possible for his men to earn the bonus, for, as in all bonus and quota plans, unless the figure is a possible one the plan is robbed of its advantages.

In order to keep his turnover of salesmen at a minimum this distributor has issued to each man a $$00 certificate of stock in the company and has impressed upon them the fact that they are all actively interested shareholders. Inasmuch as the stock is yielding them a fair dividend, they not only feel that it is to their interest to increase the sales of the company to the best of their ability but also take an active interest in keeping the company's overhead down to a minimum.

New Starter Drive Has Self-Engaging Cone Clutch

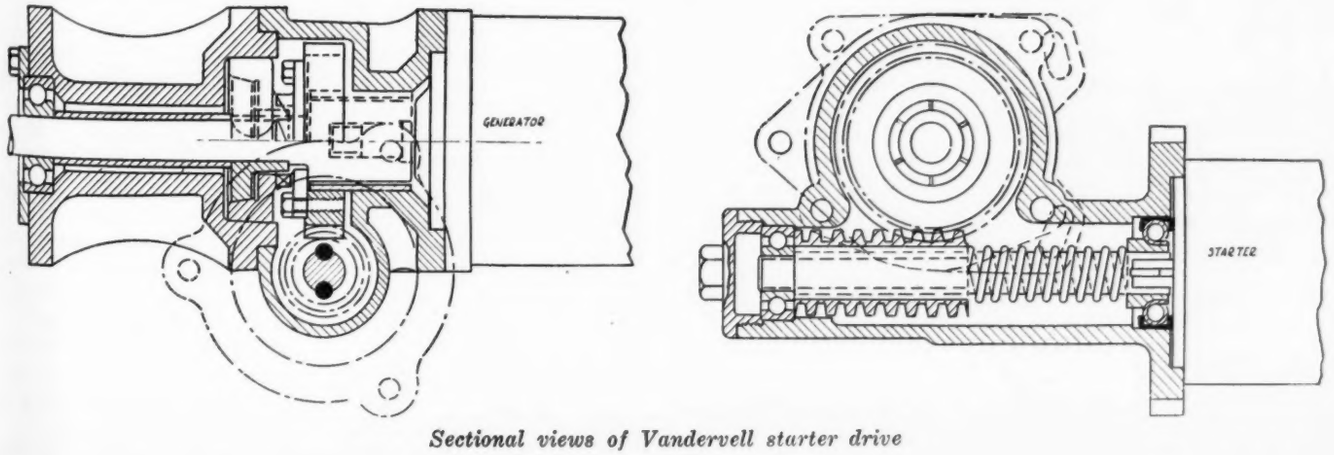
SILENCE, smoothness in operation and impossibility of jamming are claimed on behalf of a new engine starter drive put forward by C. A. Vandervell & Co., Acton, London, W. 3., manufacturers of automotive electrical equipment.

The starting motor is arranged at right angles to the driven shaft, which may be a prolonged drive shaft for the generator. In the form shown in the sectional views the housing of the gear is intended to be bolted to the rear face of the distribution casing, interposed between the latter and the generator.

The motor shaft is prolonged and carries on splines a three-lead worm backed by a buffer spring. Fixed to the generator drive-shaft is a worm wheel or skew gear, on one side of which are dog-clutch teeth with inclined faces on the driving side engaging with similarly shaped dogs integral with the female member of a metallic cone clutch; the male member of the latter is keyed to the drive shaft.

When current is passed to the motor, the worm wheel rotates slightly with the generator drive-shaft, but in doing so causes the female half of the cone clutch to be moved axially, owing to the inclined faces of the dog clutch and the tendency of the female cone to lag slightly in relation to the movement of a worm wheel. In moving thus, the female cone engages with the male portion, and by this means power is conveyed from the motor to the distribution gear, or other means of transmitting the drive to the crankshaft. The angle of the cones is 10 deg., which permits the drive to be taken up without undue slip and disengagement to occur without fear of jamming.

As soon as the engine starts and over-runs the starter drive, the load on the clutch and the inclined sides of the dog teeth is reversed, thus freeing the cone clutch. In the event of a backfire occurring no damage arises, for the angle of the worm gearing is such as to permit of reversibility.

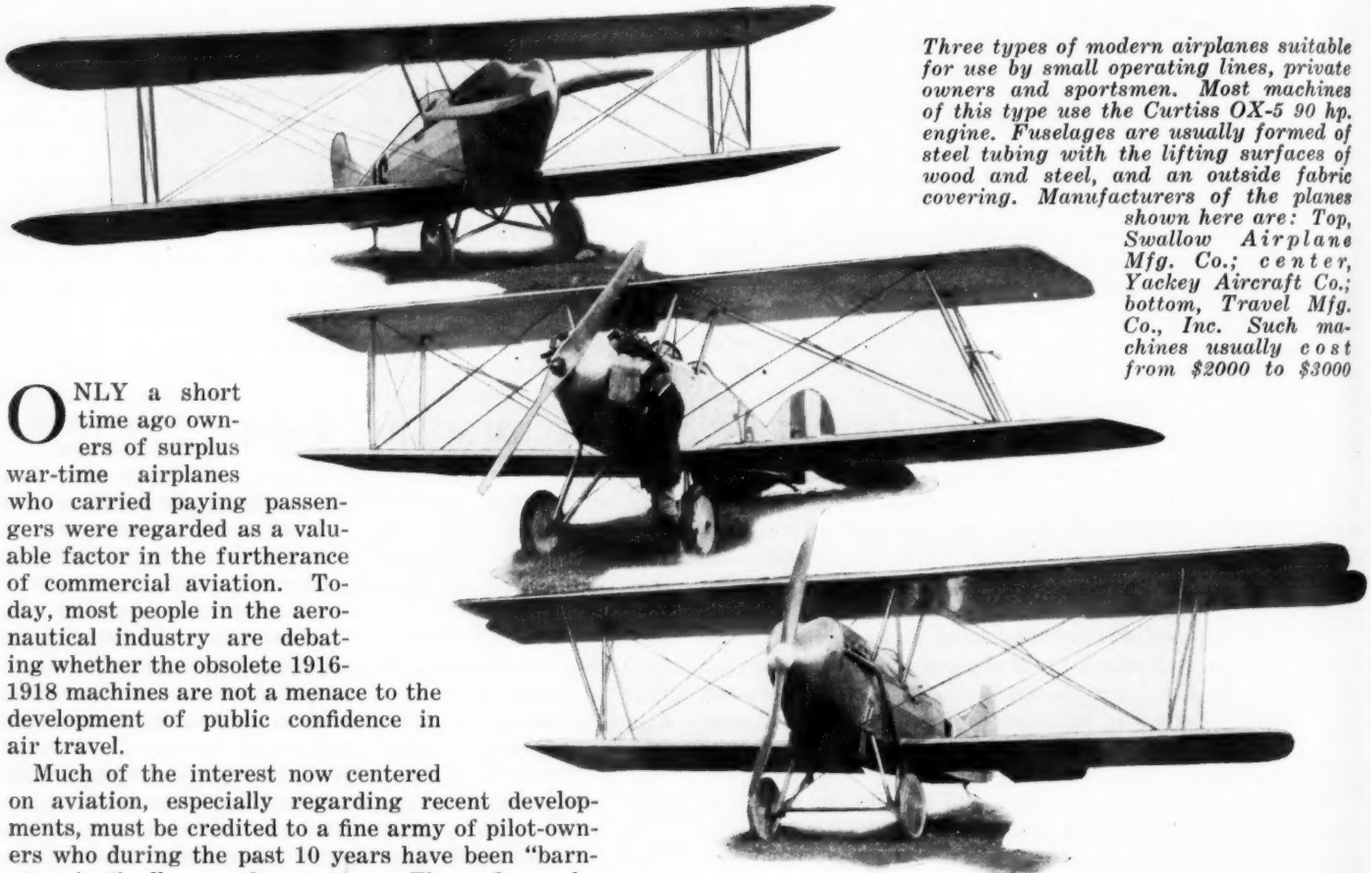


Sectional views of Vandervell starter drive

Aviation Owes Much to Care-Free "Gypsy" BUT—

in His Delapidated War-Time Plane

By Leslie S. Gillette



Three types of modern airplanes suitable for use by small operating lines, private owners and sportsmen. Most machines of this type use the Curtiss OX-5 90 hp. engine. Fuselages are usually formed of steel tubing with the lifting surfaces of wood and steel, and an outside fabric covering. Manufacturers of the planes shown here are: Top, Swallow Airplane Mfg. Co.; center, Yackey Aircraft Co.; bottom, Travel Mfg. Co., Inc. Such machines usually cost from $2000 to $3000

ONLY a short time ago owners of surplus war-time airplanes who carried paying passengers were regarded as a valuable factor in the furtherance of commercial aviation. Today, most people in the aeronautical industry are debating whether the obsolete 1916-1918 machines are not a menace to the development of public confidence in air travel.

Much of the interest now centered on aviation, especially regarding recent developments, must be credited to a fine army of pilot-owners who during the past 10 years have been "barnstorming" all over the country. These flyers, by inducing people to take their first "joyride" in an airplane, have been able to make a living and maintain their planes, thus unknowingly doing more probably to spread the gospel of aviation in all parts of the country than has been possible by other more spectacular aerial achievements.

The first airplane seen close up by most people was one piloted by some "gypsy" flyer who arrived on the outskirts of the town the day the country fair opened. Had it not been for these picturesque "air tramps" tens of thousands of our population to this day might never have grasped the principles and practibility of airplane travel. While these reasons alone are sufficient to warrant the assisting rather than suppressing of "gypsy" pilots, it must be borne in mind that the number of accidents that have occurred to the "gypsy" aircraft have had a bad reaction on the public.

In few cases can a disaster be traced to error on the part of the pilot's judgment. Usually it is found that a weakness in the machine or a faulty engine is the cause. These men in most cases are compelled to work without the facilities of a hangar and the bad effects of having wood and fabric-built planes exposed to heat, rain and snow for months, or even years, will be readily appreciated. Furthermore, the overhauling and repairs to the engine and plane usually have to be made in the open and this practice naturally is not conducive to reliable operation.

Wherever there is an assembly of modern airplanes such as those attending national air meets and races, there are numerous out-of-date machines present which would never be allowed to fly if there were compulsory inspection of aircraft by the Government or other official body. Several hundred flights may be made in the course of a day by the modern planes at the meet and the public assembled is likely to begin to regard commercial aviation as having reached a fair degree of safety because of witnessing so many successful flights. Later in the day, however, one of the obsolete ships not taking an active part in the affair "cracks up" during a "show-off" flight and not only is the benefit of the whole day's flying lost, but flying is again branded as a hobby for thrill-seekers.

To the spectators, the accident to the "gypsy" is just

He Destroys Public Confidence in the Safety of Air Travel!

Flying as an industry will receive better support when steps are taken to bar unsafe, obsolete craft from air. Proper maintenance the big problem.

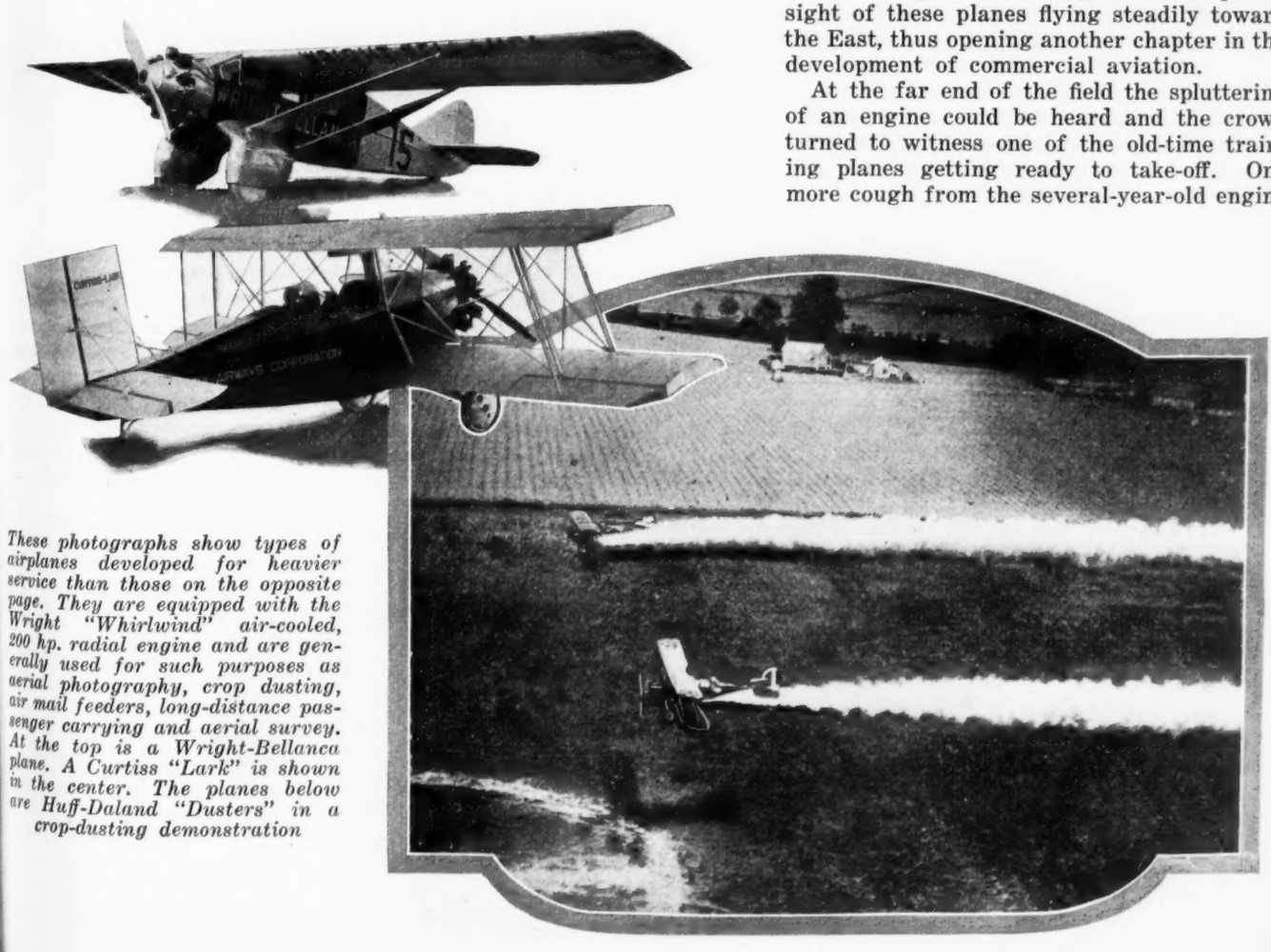
another crash. They do not know that the wrecked ship was in no condition to fly, nor do they realize that an accident of this nature would be highly improbable with the modern planes they had seen flying all day.

A good example of how one of these obsolete type machines constantly runs the chance of accident and of inflicting psychological setbacks to commercial aviation is an incident which occurred in Detroit recently.

Three thousand citizens of Detroit who have the highest faith in the future of commercial aviation watched with interest the preparation of the Ford airplanes for carrying U. S. mail on the inauguration flights of the first privately operated air mail routes in the country. The spectators, interested enough to stand ankle deep in the snow early on a bleak February morning, included in their numbers several prominent local business and financial men who were following the development of the commercial air lines closely. These men had long felt the necessity of having direct connection with the U. S. trans-continental air mail and were glad that the contract of carrying mail to and from Chicago and Cleveland had been awarded a Detroit firm which had been operating commercial freight carriers over this route for several months.

When all mail sacks had been stowed away in the freight compartment of the all-metal monoplane and the engine started, the crowd cleared a way to allow the plane to taxi out to its take-off position. With its nose headed into the wind, the Ford freighter left the ground, climbing steadily in spite of nasty gusts. Attention was temporarily diverted from the Ford plane to two groups of three pursuit ships, each maneuvering to take-off. In a flash all six machines were climbing at a fast steep angle and soon had fallen in place alongside of the Ford plane they were detailed to escort. No one present could restrain from waving and cheering at the inspiring sight of these planes flying steadily toward the East, thus opening another chapter in the development of commercial aviation.

At the far end of the field the spluttering of an engine could be heard and the crowd turned to witness one of the old-time training planes getting ready to take-off. One more cough from the several-year-old engine



These photographs show types of airplanes developed for heavier service than those on the opposite page. They are equipped with the Wright "Whirlwind" air-cooled, 200 hp. radial engine and are generally used for such purposes as aerial photography, crop dusting, air mail feeders, long-distance passenger carrying and aerial survey. At the top is a Wright-Bellanca plane. A Curtiss "Lark" is shown in the center. The planes below are Huff-Daland "Dusters" in a crop-dusting demonstration

and the plane started across the ground. After a considerable run it commenced its long, slow and uneven climb and rocked unsteadily after each "bump." The comparison between the flying of this plane and the ones that had just left the ground was so obvious the crowd was forced to laugh. Finally, reaching about 300 feet altitude, the wheezing engine coughed again and then died completely, leaving the pilot a short time to look for a spot to land. It was necessary to land down-wind to get into the field. Landing down-wind under any condition is a dangerous procedure and this coupled with uneven snow-covered ground hemmed in by trees, caused the spectators to catch their breath in fear of the accident which seemed to impend. But the crowd in this case was spared any gruesome spectacle, for the pilot was fortunate and skillful enough to effect a landing without doing any considerable damage to the machine, much to the amazement and relief of everyone.

Had fortune been against the pilot, aviation would have suffered a setback in the minds of the watchers, and the impressive sight of the inaugural flights would have been clouded if not lost.

Public Shows Keen Interest

In the state of Michigan at this time the public is appreciating the possibilities of air travel and visual proof of this can be seen by the unusually large crowds that swarm to every flying field when special flights are being made. These people are more than just interested in the actual flying; they want to see the planes close up and learn the latest improvements. As guides are not provided, the spectators have to find things out for themselves and the fact that the old "flying bird-cages" with their maze of wires and struts stand on the field without a single admirer further proves that the public is interested in planes that even to the uninitiated look as though they would fly safely and well.

There is as much difference in appearance, reliability and performance between the "flying bird-cages" and the up-to-date private passenger planes as there is between the 1914 and 1926 automobiles.

During the past year over half a dozen factories have been turning out commercial airplanes for the small operator or sportsman, in quantities. These machines represent the world's finest aircraft in this particular field and their general performance and air-worthiness is the highest desired. While large quantities of the planes have been sold, the purchasers in most cases are pilots who have been accustomed to high performance planes. Unfortunately, for several reasons, very few of these machines have found their way into the hands of the "gypsy" pilots, the main obstacle, of course, being the high cost. Prices for these planes range from $2,000 to $6,000, or from twice to six times as much as would be paid for the usual war machine.

Too much praise can never be bestowed upon the good work that has been done by these war machines and it is hoped that a sufficient production of the newer types of planes will warrant a considerable reduction in price so that it will be as easy to purchase one of the latest planes as it was to secure one of the old machines. To this day, the flying qualities of the war-time machines, in which thousands of our aviators were trained, sets a very high standard and there is little doubt that if these planes could be given the same attention as was given them during the hostilities they would be able to function satisfactorily.

Many operators and private owners have the facilities and experience to overhaul and rebuild their machines after a certain number of air-hours in the same manner as employed in the air service, with the result that the performance of their ships is highly creditable. But a large majority effect repairs only when necessary and in many cases after the plane has been standing in the open for several weeks.

After modern planes have been allowed to stand out in all weather for months or years, they will be, doubtlessly, in a similar condition, but it is believed that with the purchase of a new factory airplane the owner will give it greater care and protection from the ravages of the weather, which plays the greatest havoc in shortening the "safe" life of an airplane. The use of steel to a great extent in the construction of up-to-date planes offers a higher factor of safety, and eliminates several disadvantages attributed to wooden construction.

The effect of the weather on old-time planes may be summarized:

Major parts of the wooden framework warp and lose strength.

Fabric covered wings and control surfaces becomes loose, worn and soggy, seriously affecting the lift and speed of the plane.

Metal parts such as control wires, fittings, etc., become rusted with likelihood of possible fracture.

Engines do not develop power because repairs are usually made on the plane where it is impossible to give a complete overhaul satisfactorily.

When legislatures take a hand in the inspection and licensing of aircraft it is hoped that one of the requirements will be that the operating plane must be housed at the end of the flight or that a maximum time be allowed in which it may be away from a hangar. The fundamental criticism of the war-time planes is not in their air performance, safety or age, but that by reason of circumstances they have been neglected and their effectiveness impaired.

Books for the Business Bookshelf

Industry as Service to World

"THE industrial executive, when he considers his responsibilities from the broad viewpoint, must primarily look upon industry as a service to the world," is the way B. A. Franklin states his views in his book "The Industrial Executive." Management of a business, he believes, has two principal phases. One is the detail operation of the enterprise so that all the directly interested parties—the management, the workers, the stockholders—will receive benefits commensurate with the service they render to the business; the other is the service which the business gives the world at large, not only in supplying articles for use and consumption but as service centers to those employed and co-operating in the business.

These two phases are discussed in the book and their discussion introduces thoughts on many subjects related to business management, such as production control, personnel management, marketing, organization, etc. The book is one of the Ronograph Library published by Ronald Press Co., New York.

German Automobile Yearbook

AFTER an interruption of many years the Automobile Club of Germany has continued the publication of its yearbook, the tenth edition of which made its appearance recently. It bears the title of Jahrbuch des Deutschen Kraftfahr u. Motorwesens, which is perhaps best translated as Yearbook of German Motoring and Motor Transport, and contains a series of articles dealing with historical, technical and economic subjects, as well as with automobile sporting events of the past year. Among the articles may be mentioned the following: Sporting events of the year 1925, by Wilhelm Kirchner; the Development Period of Air Navigation, by Dr. Hildebrandt; Austria's Share in the Development of the Automobile, by Ing. Kurzel-Runtscheiner; Practicability and Design of Motorcycles, by P. Friedmann; Progress of Berlin's Omnibus Service, by G. Quarg; Heavy Trucks in the Transportation of Freight and Passengers, by Major Bilau; Internal Combustion Engines in Agriculture, by Dr. Schwanecke. The book is published by Dr. Ernest Valentin Verlag, Berlin.

History of the Link-Belt

WE wonder how many persons, when thinking of the important part the Link-Belt organization and products play in present day automobile production and in many other lines of human endeavor, realize that this industry owes its existence to the troubles farmers had with the drive belts of the "new fangled" binders of 50 years ago.

In 1875 William Dana Ewart started out to build a self-binding harvestor, but he knew from the experiences of farmers with this new type of equipment that the great need was for a detachable chain drive that could be repaired in the field. One Sunday morning while in church the idea came to him of a square detachable link. He took his idea to the King & Hamilton Co., of Ottawa, Ill., and there received such encouragement that the Ewart Manufacturing Co. was incorporated in the same year for the production of chain drives embodying the new link. In 1880 the name was changed to the Link-Belt Machinery Company. The history of Link-Belt is told in a very interesting way in a booklet published by the company to commemorate its fiftieth anniversary and entitled "Link-Belt 1875-1925."

Planning for Future Business

ANY business in order to be successful must plan its future course. Upon the care with which this is done often depends the profits which are derived from operation. Planning for the future, or forecasting as it is often called, may be made a matter of guess work based on opinions and surmises or it may be based on exact study of the past movements of the business and how they may influence the future. The latter method is of recent origin—little having been done along this line until after the war. For this reason a book such as Joseph H. Barber's "Budgeting the Business Cycle" is especially valuable because it gives in considerable detail the various steps taken by one concern in applying its knowledge of what had happened in the past to forecasting the future. The book is well illustrated with charts and tables so that the methods employed may be easily understood and adapted for most any other business. The book is a Ronograph and is published by Ronald Press Co., New York.

Measuring Purchasing Power

IN most market surveys some index of the purchasing power of the consumer is valuable and often is a necessity in obtaining reliable results. Three methods of determining this factor based on the incomes of factory workers, on the various studies of family budgets that have been made in recent years, and on the activities of state employment offices are given in "Purchasing Power of the Consumer," a publication of A. W. Shaw Co., Chicago.

This book contains the prize winning essays in the J. Walter Thompson Prize Essay Contest which were submitted by William A. Berridge, Emma A. Winslow, and Richard A. Flinn. Each essay develops a definite technique for measuring the buying power of consumers living in different parts of the country, in varying types of communities, and under divergent conditions of prosperity and depression. They should be of real use in the more accurate measurement of purchasing power.

Heald's 100th Anniversary

COMMEMORATING an event which occurs in the history of but few manufacturing organizations—its one hundredth anniversary—The First Ledger has been published by The Heald Machine Company. As its title signifies, possibly the most interesting part of the brochure are facsimiles of the opening pages in the first ledger of the company bearing the date of January 7, 1826.

THE FORUM

Oil Testing Machines Give Misleading Results

Editor AUTOMOTIVE INDUSTRIES:

A few weeks ago a short article in *Automotive Industries* described an oil testing machine being utilized by a purchasing department in the middle west. This machine consisted essentially of a plain bearing which could be run at various speeds, loads and temperatures, and afterwards examined for wear. This type of machine is constantly being rediscovered because it looks so simple and so eminently practical, but it is significant that machines of this sort have for years been completely abandoned by all scientific laboratories because of the misleading results they inevitably give.

In a perfectly lubricated bearing, the metal surfaces do not touch each other, and no wear takes place. Such a condition has been nearly reached with the Kingsbury type of thrust bearing used principally on large turbo generators. The effect of running oil in such a bearing is to produce sludge in the oil after a long time, but an equivalent effect can be obtained in a laboratory by much simpler methods.

Journal Bearings Never Perfect

The journal bearing on a shaft can never be made perfect and can never be lubricated perfectly, consequently there is always some metallic contact. The slowest wear in running such a bearing will occur with the oil that happens to have the most suitable viscosity, but the trouble begins when one run has been made and the next is started because some wear has taken place, the fit of both bearing and shaft have changed. Supposing at the first run there was a 90 per cent bearing surface, at the start of the second run there might be anything from 50 per cent upward. Now it is obvious that a change of 10 per cent in the effective surface will change the film pressures, the perfection of film formation, and that the rate of wear will consequently be changed. This can readily be proved by the impossibility of getting check results with the same oil in such a machine. All that such machines can measure is the degree of perfection of the oil film, and this depends upon the condition of the bearing, the condition of running and the viscosity of the oil, no other oil characteristic entering into the question.

A. LUDLOW CLAYDEN
Sun Oil Co.

More About Diesel Engines

Editor AUTOMOTIVE INDUSTRIES:

The only point made in Mr. Hautzenroeder's letter in your issue of Jan. 28 which I doubt is where he states that a Diesel engine has been running at 3000 r. p. m. in Germany. I have been experimenting with and running Diesel engines for years, so I know pretty well what it means to run a high pressure engine at "only" 1300 r. p. m., and I also know what it means to blow off a cylinder head by a detonating charge. At the same time this occurred the crankcase split and the cylinder followed the head up into the air.

A single cylinder, high-pressure, 10 in. bore engine running at 300 r. p. m. suddenly started detonating, with the result described. Before the heavy flywheel could be stopped (by short-circuiting the generator) the piston and connecting rod had smashed everything within reach.

Doubtless the combustion can be made fast enough for high speed engines. There ought to be a good increase in mileage with a constant pressure engine, especially at the lighter loads, as the fuel consumption curve is very flat compared with that of a carburetor engine.

Perfect Combustion Important

With perfect combustion this type of engine has an odorless exhaust, but as soon as the combustion is incomplete the smell is nasty, as is well known from the hot bulb engine. It will therefore be very important to secure uniformly perfect combustion under all conditions.

Mr. Hautzenroeder mentions the small penetrating power of a fuel spray into highly compressed air. In this connection it is fortunate that the cylinders of any Diesel type truck engine need not be very large, and the distance the fuel spray has to penetrate will be less than 2 in. More weight can therefore be laid on atomization and less on penetrating power of the spray. Turbulence of the air set up by some means, not necessarily the piston, will take care of the distribution of the fuel charge.

Mention is also made in the letter of high average piston and bearing pressures. Well, the compression cannot be reduced below 400 lb. p. sq. in., but it need not be higher than 500 lb. and may be controlled by a floating displacement piston. If the most suitable type of engine—the two-stroke type— is used, the bearing pressure need not be excessive, provided the inertia of the reciprocating parts is made great enough to counteract the greater part of the gas pressure on the piston. If this pressure is completely balanced at the maximum speed, say 1300 r. p. m., than it will be one-half balanced at 70 per cent of maximum speed, which would probably be used most.

In a small engine such as this it would not be necessary to use such a high pressure as 10,000 lb. on the fuel; I feel perfectly safe in stating that 1000 lb. will be enough, at least with a fuel valve I have in mind.

HUGO MOREN

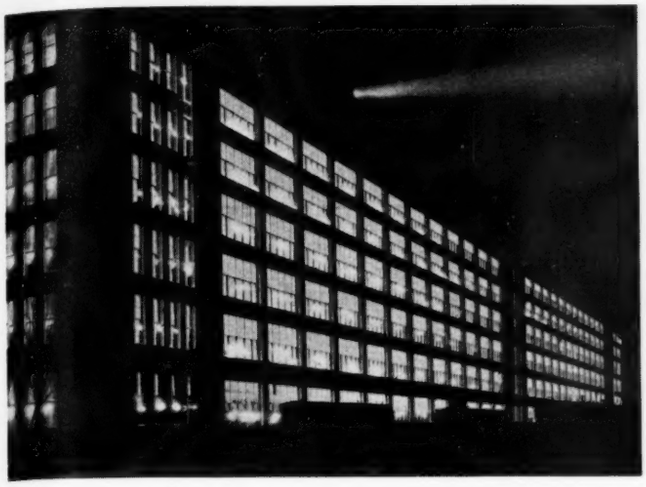
Studebaker's Beacon Light

Editor AUTOMOTIVE INDUSTRIES:

On page 147 of the Jan. 28 issue you publish a letter which has been sent to you in regard to the first civilian concern or institution to erect a flashing beacon for the direction of aviators at night.

While no mention is made in this letter of when the beacon lights were erected by the Atlantic Refining Co. and New York University, we have had a beacon light of this type on our closed body plant for over two years, and the light is in operation each night.

I am enclosing a photograph to show you the nature of this light and how it operates, and it occurs to me that



A picture showing the flashing aviators' beacon on top of the closed body plant of the Studebaker Corp. of America. The light has been in operation more than two years.

you might want to give credit to an institution in the automotive industry for being the first to take this forward step.

M. F. RIGBY, Advertising Manager,
Studebaker Corp. of America.

(Mr. Rigby refers above to a brief article which appeared in the Dec. 10 issue of *Automotive Industries* and a letter which was printed in The Forum of the Jan. 28 issue. The article stated that a flashing beacon for the guidance of aviators at night had been installed on the new Philadelphia office building of the Atlantic Refining Co., and that this was the first installation of its kind to be made by a civilian organization. The letter came from Erwin H. Hamilton, of New York University, who disputed the claim of the Atlantic Refining Co., saying that a similar beacon then had been in operation at the university for seven months—Editor.)

Single and Dual Motor Drive

Editor AUTOMOTIVE INDUSTRIES:

In your issue of Dec. 24, you refer to the paper I presented before an S.A.E. meeting in Cleveland on Dec. 14, and your reporter quoted me as favoring the dual motor drive for gas-electric buses.

In my paper, a copy of which was given to the secretary of the meeting, there was no reference to this particular feature, but I departed from the paper on several occasions and, among other things, gave an historical review of the reasons that led the officials of the Philadelphia Rural Transit Co. to adopt electric drive for their buses. Their experience with mechanical drive led them to believe that the differential was responsible for a considerable amount of wheel slippage and for some cases of skidding, and they felt that the electric drive should be developed with two motors and the elimination of the differential. However, there is a broad question as to whether the differential axle behind a single electric motor would not perform far more satisfactorily then behind a mechanical transmission and clutch.

Many automotive engineers and bus operators believe that skids and wheel slippage even on icy roads would be greatly minimized with electric drive, using a single motor and a standard differential, and that the extra weight and cost of the dual motor equipment is not warranted. For example, the United Traction Co., of Albany, N. Y., has operated a number of trolley buses in which the electric motors are in tandem and drive through a differential. The experience has been that through a period of several years operation, no differential trouble has been experienced on these vehicles, and that they have operated over heavy grades through three severe winters with much less slipping of wheel than on mechanical drive buses.

The General Electric Co. has manufactured and furnished electric drive for buses with both single and dual motor drive and our engineers have no preference for one type or the other.

J. C. THIRLWALL
General Electric Co.

Are Engineers Falling Down?

Editor AUTOMOTIVE INDUSTRIES:

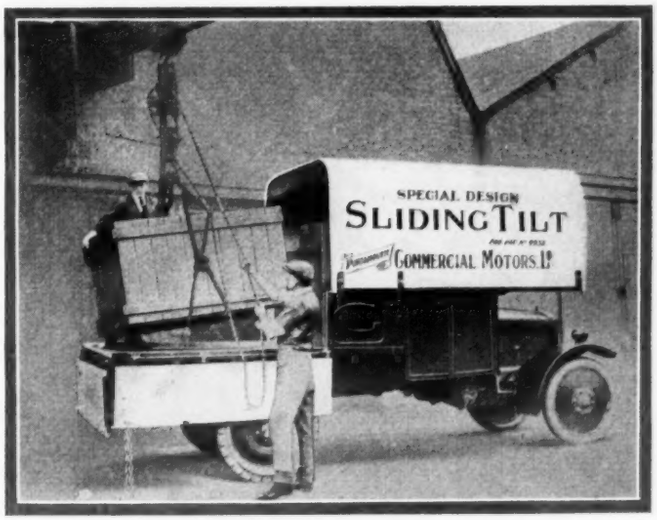
C. E. Sargent's letter in your issue of March 4 is right enough but it is not the manufacturer's fault that we do not get more miles per gallon. The manufacturers would soon build motors that were more efficient if there was any demand from the public for such cars. Are the users of cars desirous of obtaining better economy? Emphatically they are not. Are they interested in any method by which they can reduce crankcase dilution? My experience is that they do not give a "whoop" as long as they can get 25 cent oil.

I have been operating my own car for over two years without crankcase dilution by using a device that has been on the market for several years and the use of the right kind of oil. But are my friends interested? Not so that you could notice it; in fact they hardly listen to me when I tell them about it.

As long as gasoline is around 22 cents per gallon and "oil" is 25 cents per quart the dear public will go on as they are now. When gasoline goes to $1 per gallon perhaps they will wake up. In this connection it is only necessary to note that the car with the poorest economy is the best seller today. In view of this fact, what's the use?

E. T. BIRDSALL, M. E.

Sliding Top for Trucks



TO facilitate loading and unloading, a sliding top for trucks used for transporting heavy load units that need protection from the weather has been introduced in England. The top is a self-contained framework covered with stiff fabric, and can be moved forward over the driving seat with one hand. It runs on roller bearings, the front end being supported, when in its forward position, by a roller bearing attached to each side of the driver's canopy, above the front screen.

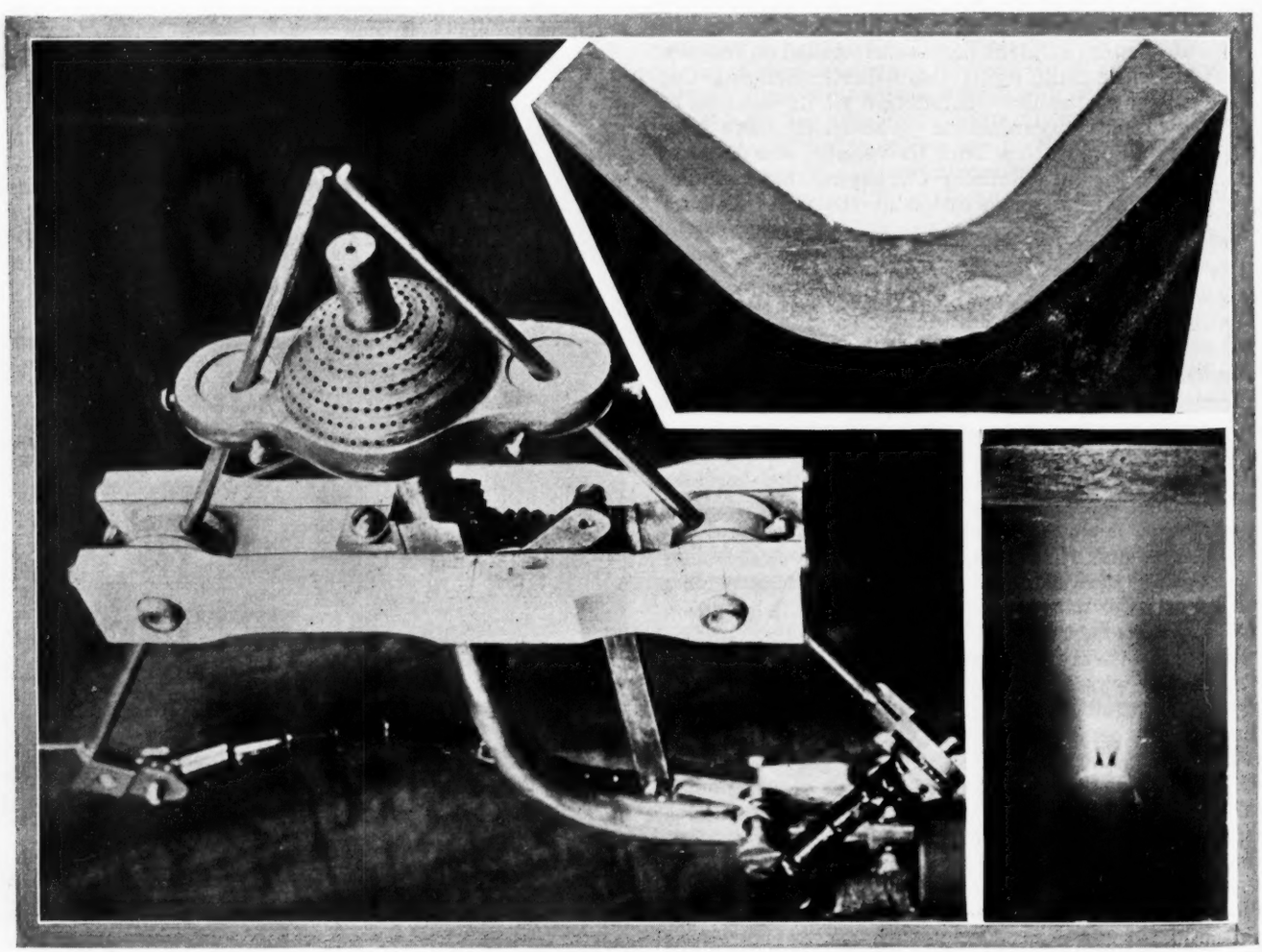
Atmosphere of Hydrogen Eliminates Brittleness of Seam Welds

Physical phenomenon first observed 15 years ago turned to account in development of two methods of welding by General Electric Co. scientists.

TWO methods for producting ductile welds have been developed by research scientists of the General Electric Company. Both of the methods, similar in some respects, are held to mark a decided step in advance in the utilization of the heat of electric arcs in the joining of metal parts or the building of metal structures. One was developed in the Schenectady research laboratory by Dr. Irving Langmuir and the other in the Thomson research laboratory at Lynn, Mass., by Peter Alexander. The following information on these processes has been furnished by the General Electric Co.

Fifteen years ago, while studying the loss of heat of the tungsten filaments of incandescent lamps in an atmosphere of hydrogen gas, Dr. Langmuir found that at a high temperature the hydrogen gas changed from the molecular to the atomic state. In the molecular state, two atoms of the gas are grouped together as a unit; in the atomic state each atom acts as a unit. The molecular form is the more stable, and when the atoms recombine to form the molecules intense heat is liberated.

Continuing the theoretical investigation, Dr. Langmuir found that more atomic hydrogen was formed by passing powerful electric arcs between tungsten electrodes at atmospheric pressure. By directing a jet of hydrogen from



LEFT: *Automatic hydrogen arc welding torch.* ABOVE: *Welded joint subjected to 90 deg. bend.* RIGHT: *Fan-shaped hydrogen arc flame*

a small tube into the arc, the atomic hydrogen could be blown out of the arc, forming an intensely hot flame of atomic hydrogen burning to the moleculer form and liberating about half again as much heat as does the oxy-hydrogen flame. In this flame molybdenum, one of the most refractory of metals, melts with ease; quartz, however, melts less easily, in spite of its lower melting point. This indicates that the metal assists in the action as a catalyzer—which scientists define as a substance which accelerates a chemical change.

By this method, iron can be welded or melted without contamination by carbon, oxygen or nitrogen. Because of the powerful reducing action of the atomic hydrogen, alloys containing chromium, aluminum, silicon or manganese can be welded without fluxes and without oxidation. The rapidity with which such metals as iron can be melted seems to exceed that in the oxy-acetylene flame, so that the process promises to be particularly valuable for welding.

The technical development of this welding process has been the work of several men in the Schenectady laboratory, including R. A. Weinman and Robert Palmer. These men have developed and tried many types of welding torches, and have tried them under varying conditions. At the same time tests of numerous types of welds have been conducted.

The two electrodes of the torch are tungsten rods, held at an acute angle with each other by lava insulators. When not in use the electrodes are in contact with each other; they can be separated by pressure on a lever mounted on the handle. A set screw is provided for making slow adjustments of the electrodes. The hydrogen is supplied by a tube through the handle. Sufficient gas is used so that not only are the electrode tips surrounded by enough to form the blast of atomic hydrogen but by an additional quantity to surround the work with hydrogen.

A. C. or D. C. Can be Used

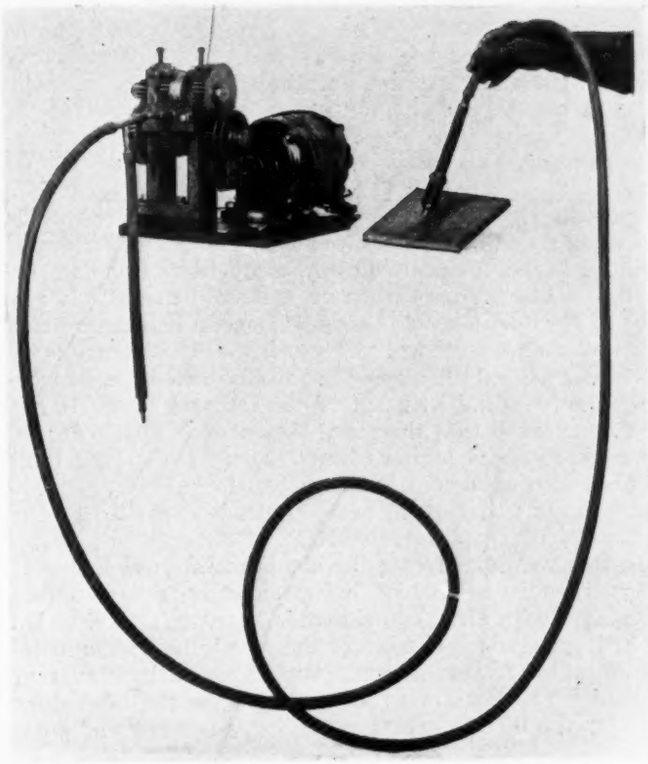
Either alternating or direct current can be used. The first mentioned has been found more convenient, and electrodes of smaller diameter can be used. The gas pressure required to operate the torch is very small. In the laboratory, with short lengths of tubing, a pressure of less than 1 lb. per sq. in. was sufficient with metals up to ½ in. in thickness. For ordinary welding, the rate of gas consumption varies between 20 and 30 cu. ft. per hour.

Since the maximum rate of heating is desired in welding, the torch is held close to the metal. Best results have also been obtained when the torch is inclined so that the blast of hydrogen from the torch passes over the pool of molten metal in a direction opposite to that in which the torch is moved along the line of the weld.

Experiments have been conducted with several gas mixtures and various electrode materials. The best results have usually been obtained with tungsten electrodes and hydrogen alone.

Materials of many kinds have been successfully welded by this method. Low carbon steels up to ½ in. in thickness have been welded without additional material after butting together tightly. Considerable work has been done also in connection with full automatic welding, using a butt joint, and with no metal being added to the seam. A number of welds have been made on seamless tubing having a wall thickness of ¼ in. and an outside diameter of 4 in. and with boiler plate iron 1 in. thick. Welds on deoxidized copper such as silicon-copper have been made up to ⅜ in. thick metal, giving unusually good sections.

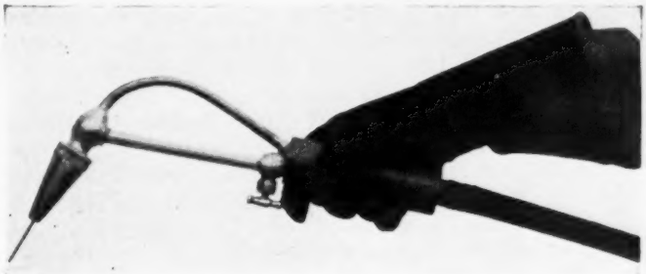
In testing welds made by this process, the welded portions have been twisted and bent double without cracking or otherwise being injured. Such a procedure has not been possible with the ordinary arc weld, since such welds are usually brittle because of the presence of nitrides or a thin film of oxide or scale, removed in the new process by the presence of hydrogen.



Automatic wire feeding device with attachment for welding in hydrogen atmosphere

By surrounding the ordinary welding electrodes with an atmosphere of hydrogen or certain other gases, it has been found by Mr. Alexander of the Thomson Research Laboratory at Lynn, Mass., that it is possible to produce ductile welds. The gas acts as a flux and shield against the oxygen and nitrogen of the air, therefore the formation of oxides and nitrides of iron in the molten metal is prevented. The process originated from the study of metallurgy of the arc-deposited metal and the causes that limit its ductility.

The method is based on the action of molecular hydrogen. This gas at high temperatures, even in the molecular state, is a very active reducing agent. When it surrounds the crater of the arc it acts in the same way as it does in the hydrogen brazing process. Yet certain peculiarities of the process (for example, the extremely high voltage drop at cathode and anode of the arc burning in hydrogen) are due to the dissociation of the small amounts of molecular hydrogen in actual contact with the craters. Hence the apparent resistance of the arc, and consequently the amount of energy liberated, is about double that when the arc is burning in air.



Torch for welding in hydrogen with metallic electrode

Consequently the weld is not only ductile, but the operation is much faster. The speed results both from the greater energy of the arc in the hydrogen atmosphere and the fact that beveling of the edges of the material is unnecessary. Using 180 amperes and an arc voltage of 60, one-quarter inch boiler plates, butted together without beveling, have been welded at a speed of 60 ft. per hour.

Ductility is a factor of prime importance in the welds of structures that are subjected to vibration, accidental bending stress, or overload. Also, ductility equalizes internal cooling stresses when present in the weld. If any part of the ductile weld is stressed beyond its elastic limit, it will not crack. It will yield until the stresses are more or less equalized all along the joint, which is so proportioned as to stand with safety the imposed load. It has also been found that the metal deposited in the hydrogen atmosphere has a higher elastic limit. The elastic limit of pure iron electrodes before deposition averages 29,000 lbs. p. sq. in.; that of the same electrode deposited by the arc in hydrogen averages 42,000 lb.

In this welding process the arc is maintained inside of a hydrogen stream which burns along its outer surface of contact with air. The electrode is entirely surrounded by hydrogen, which eliminates the possibility of the metal in the crater coming in contact with air. Direct current is used. The equipment as developed in the laboratory includes the direct-current generator, gas hose, and spool of welding wire mounted as a unit on one base. The welding wire, the hydrogen gas and the electric current are sent through a flexible hose to the torch nozzle.

After the work with the hydrogen atmosphere was found to be successful, experiments with mixtures of hydrogen and carbon monoxide were conducted in accordance with Professor Elihu Thomson's suggestion, and under his personal guidance. Water gas, containing about equal volumes of hydrogen and carbon monoxide, was next tried. It was found that welds produced in such an atmosphere were ductile and easier to produce. Work with various mixtures of carbon monoxide and hydrogen, produced either synthetically or by decomposition of various organic compounds, demonstrated that ductile welds can be produced in the atmosphere of any mixture of the two gases. Methanol or synthetic wood alcohol was found to serve well in this gas, so that transportation with portable outfits is facilitated.

A series of experiment with nitrogen-hydrogen mixtures showed that mixtures of these gases also give ductile welds. The use of liquid anhydrous ammonia which contains one volume of nitrogen and three of hydrogen, in this connection makes it possible to store large quantities of the gas in small volume as a liquid.

In brief, this process is a combination of an electric arc (which supplies the energy) and an appropriate chemical reagent which, being in a gaseous state and at extremely high temperature, acts almost instantaneously.

Properties of Flexible "Glass" Described by Inventor

THE Vienna correspondent of *The Motor* (London) has interviewed the joint inventor of flexible "glass," the evolution of which was announced in cables from England in January. Two prominent Vienese chemists are stated to be responsible for this new material, Drs. F. Pollak and C. Ripper, who are in charge of an artificial resin plant. The correspondent of *The Motor* states that in the inventors' laboratory at Vienna he saw Dr. Pollak, who said they were only just beginning to manufacture flexible glass for the various industries demanding it.

Dr. Pollak said: "The raw material is a colloid, that is, a substance of gelatinous glue-like appearance which is produced by a synthetic process from carbamide (a derivative of urea) and formaldehyde; it is thus purely organic. Until our research work commenced no one knew how to make an organic colloid of any kind by synthesis. Flexible 'glass,' needless to say, has absolutely nothing in common with celluloid or other similar products. As to its physical properties, it shows a hardness figure of 2.95 on the Mohr scale and is thus just a little softer than calc-spar. To give an idea of what this degree of hardness means I may point out that it is only slightly softer than mother-of-pearl, which, on the same scale, gives a figure of 3.1.

"The specific gravity of flexible 'glass' is 1.44 and is therefore about half that of ordinary glass, which varies from 2.5 to 3.9. Its strength, or toughness, is twice as great as that of juvelite (a condensation product of phenol-formaldehyde). In a crushing test made by the technical laboratory of the Vienna Technische Hochschule flexible 'glass' gave the high figure of 2,230 kg. p. sq. in. (31,660 lbs. p. sq. in.); the corresponding figure for juvelite is only 1,170 kg. In tests for tensile strength and bending, flexible 'glass' showed up equally well and it resists temperatures up to 250 deg. C."

Dr. Pollak, demonstrating the exceptional resiliency of the new substance, showed that a ball made of the material would bounce after the style of rubber, and that bars of various thicknesses could be bent to a remarkable extent. He also demonstrated that flexible 'glass' does not splinter like ordinary quartz glass when broken. The new substance has a marked resistance to atmospheric influences and will resist the action of acids to a certain extent.

Dr. Pollak believes that flexible 'glass,' owing to its unusual properties, will be extensively used in the future to replace ordinary glass, especially for the windows and windscreens of motor vehicles. In addition to other specimens, Dr. Pollak showed some spectacles with flexible 'glass' lenses, which, in addition to being perfectly transparent, had excellent optical properties.

The inventor also pointed out the extensive use which can be made of the new material for electrical apparatus of all kinds, as it is an excellent insulator. It can be employed wherever hard rubber and similar substances are at present being used, can be given a similar appearance to any of the ordinarily used insulating materials, and has the advantage of being easier to manufacture. Further, the particles which are removed by turning or any other form of machining in the course of manufacture can be collected, formed into large lumps by pressure and employed for the manufacture of other articles.

INDUSTRY in Italy is largely dependent on hydro-electric power. The generation of electrical energy from water power reached 1 billion kilowatt-hours in 1908; 2 in 1912; 3 in 1916; 4 in 1920 and 6.5 in 1924. While in most other countries most of the electrical energy produced is used for lighting purposes, in Italy only 9 per cent of the total is used for lighting and over 51 per cent is used for power purposes in what are classed as the mechanical industries.

EDITORIAL

Still Running in High

IS the industry in the process of overproducing? Does a series of record production months mean that dealers are going to be overstocked again and factories forced to curtail rapidly as they did in 1924?

These are questions that are being carefully considered today by thoughtful executives. Size of dealer stocks must be judged, of course, on the basis of rate of sales. When cars are moving rapidly a given stock may be adequate to meet two weeks' demand; if the rate of sales slows up suddenly, that same stock might be sufficient for two months' demand. Overproduction can be discussed only by relating directly the sales rate with the actual production.

On this basis, it would appear that the danger of overproduction exists if output does not decline before sales do. Used cars are not moving well and this fact must be considered in any basic study of production possibilities.

Distinct differences of opinion exist as regards the length of time during which the industry safely can continue at maximum production speed. E. S. Jordan says, "It looks like top speed at least until we are well into the summer and probably throughout the balance of the year." An important government official, speaking informally the other day, stated his belief that the peak of production already has been reached in most industries, but that overproduction has not yet taken place. Other observers believe that some degree of overproduction already exists. The actual facts probably represent some mean of the three opinions.

Measures of Acceleration

TECHNICALLY, car acceleration is expressed in feet per second per second or in miles per hour per second. These units are rarely used in the advertising literature of car companies because they are unfamiliar to the layman and do not convey any meaning to him. The usual method of presenting acceleration performance to the prospective customer is to say that the car will pass from a to b miles in v seconds.

But while this method of stating the acceleration performance is definite the figures really mean very little to the layman. He does not deal with acceleration figures sufficiently often for them to become fixed in his mind. Very few motorists, even among the most experienced, would be able to say whether an acceleration of 5 to 25 m.p.h. in 8 seconds is low, normal or high. One of the reasons for this unfamiliarity with the subject is undoubtedly that the motorist ordinarily judges pick-up in terms of space covered rather than in terms of elapsed time.

It would therefore seem advisable to quote acceleration figures on a distance basis For instance, from 5 to 25 m.p.h in 220 ft. would convey a more definite meaning to the average motorist than from 5 to 25 m.p.h. in 10 seconds, which is substantially the same.

Turbine Drives

IN Europe considerable attention is being paid at the present time to a form of hydraulic drive for motor vehicles making use of the turbine principle in both the pump and the motor. Coupled to the engine is a rotary pump not unlike the water pump of the cooling system, but, of course, of more refined design. The water moved by this pump is delivered to a turbine type of hydraulic motor containing a number of chambers side by side, each with its turbine wheel or rotor, all of these rotors being fastened to the same shaft.

If all of the water moved by the pump is passed through one of the chambers, its speed will be high and the driven shaft will run fast but have a comparatively low torque. By passing the water through two or more of the chambers in parallel, the speed of the water is reduced, hence the speed of the driven shaft is also reduced but its torque is increased. Change from one speed to another is effected by means of a sliding valve.

The problem of power transmission from automotive internal combustion engines in large units, particularly on railcars and locomotives, cannot be regarded as fully solved, and there is a possibility that the hydraulic drive will furnish the solution. It is true that past experience with hydraulic drives in the automotive field has been anything but satisfactory, but most of the former drives of this type made use of plunger pumps and piston type hydraulic motors, and the introduction of the turbine marks an entirely new line of attack.

Congress and the Industry

THE tax reduction on passenger cars went through and the public already has been given the benefit of it on most cars. A three per cent tax still remains. Within another year that too should be off, for the industry now has gained acceptance of its principle that the motor vehicle is not a luxury and that it should be relieved of war taxes levied during an emergency which no longer exists.

There is every indication that the appropriation for Federal Aid for highway construction will get through both houses of Congress. Thus a constructive, coordinated program of highway development is sure to be continued. Other actions of the present Congress have been relatively favorable to automotive needs.

AUTOMOTIVE NEWS SECTION INDUSTRIES
Philadelphia, Pennsylvania Thursday, March 18, 1926

Automotive Sales Aided by Price Cuts and Weather

PHILADELPHIA, March 18—Sales of automotive products have improved materially in the last two weeks, having been aided by good weather and by price cuts made by most of the large manufacturers in advance of the day when the reduction in taxes on motor cars goes into effect. Production has also gained, and the large-volume factories with one important exception are now at or above the highest rates of output in their histories. For these companies, first-quarter production will be greater than in any previous year.

The rapid rate of output is symptomatic of the intensity of current competition. Generally speaking, the well-stocked dealer is likely to put forth stronger efforts to sell cars than the dealer with fewer cars on hand and therefore lower carrying charges to meet. There is no objection to the practise of stocking at this time of year unless the dealer is overloaded to such an extent that he will far overstep the bounds of sound business in allowances on trade-ins. This tends to glut the used-car market and cause heavy casualties in the dealer-ranks.

Factories in Safe Position

Although in some quarters the opinion is expressed that production has been exceeding sales by too wide a margin, it is generally acknowledged that the factories are still in position to curtail in time to avoid serious difficulties should the sales market fail to meet expectations.

Another price cut has been announced by a large producer of sixes, but otherwise list prices, which are not affected by the tax situation, have remained fairly stable, there being one or two instances of revisions upward. The manufacturers are in good condition as to costs, with development expenses on current models written off and with raw materials, tires and some other items of original equipment lower in price.

Conrad A. Haertel Dies

WAUKESHA, WIS., March 15—Conrad A. Haertel, 75, founder and for ten years president of the Waukesha Motor Co., died at his home here on March 2, following a long illness.

Mr. Haertel was born in Prussia in 1851 and came to America with his parents in 1856, settling in Waukesha. In 1901 he took a leading part in organization of the Waukesha Malleable Co., which was sold twenty years later to General Motors. He had been president of the company for many years. Mr. Haertel then founded the Waukesha Motor Co., of which he was president for ten years, resigning last year, because of ill health, to become chairman of the board of directors.

Equipment Sections for National Shows

Modern Servicing Methods to be a Feature of 1927 Exhibitions

NEW YORK, March 17—The National automobile shows in 1927 are to feature modern methods of servicing motor cars and trucks, it is announced at the headquarters of the National Automobile Chamber of Commerce here today. A segregated operating and demonstrating service section will be a part of the New York, Chicago and Boston shows, according to Sam A. Miles, show manager of the chamber.

The automotive maintenance equipment show, which was conducted in the spring of 1924 and 1925 in connection with the National automotive service convention at Detroit, will not be held this year.

Approved by Equipment Manufacturers

Mr. Miles' decision was made on the recommendation of a group of service equipment manufacturers who conferred with him at Boston during the recent automobile show. The service committee of the N. A. C. C., which sponsored the two Detroit shows, was represented by W. M. Warner, service manager of Cadillac, and H. R. Cobleigh, service secretary of the N. A. C. C. The Motor & Accessory Manufacturers Association was represented by Neal G. Adair, manager of the show and educational departments.

The conference unanimously recommended that the Detroit show be omitted and effort concentrated on the development of service equipment sections in the New York show, which will open Jan. 8, and the Chicago show, opening Jan. 29. It was the concensus of opinion that shop equipment could be brought to the attention of motor vehicle factory service and sales executives at the New York and Chicago shows, and that, in addition, equipment could be demonstrated before large attendances of men in the dealer and service trade who have been unable in the last two years to attend the special Detroit shows. Aggregate trade attendances at the New York and Chicago shows have been approximately 25,000 a year, and the conference felt that, with a demonstrating service equipment

(Continued on page 508)

G. M. RETAIL SALES 64,946 IN FEBRUARY

New York, March 17—General Motors Corp. sales to dealers and to users continue to expand.

Sales by dealers to users in February were 64,946 cars and trucks, against 53,698 in January this year, and 39,579 in February last year.

Sales to dealers by divisions in February were 91,136, against 76,332 in January, and 49,146 last February.

Excess of February divisional sales to dealers over sales by dealers to users was 26,190, compared with 9,567 last year and 29,661 in 1924.

N.A.C.C. Committee Seeks United Front on Ainey Bill

NEW YORK, March 6—A committee consisting of T. R. Dahl, vice-president of The White Co., as chairman, D. C. Fenner, of Mack Trucks, Inc., and W. H. Brearly, of The Autocar Co., will represent the truck committee of the National Automobile Chamber of Commerce at the Washington hearing next week on the Ainey bill for regulation of motor trucks and buses in interstate service.

Previous to the hearing the committee will be active in attempting to coordinate the views of the different branches of the industry so that something in the nature of a united front may be presented. As matters stand now, the truck men oppose the bill and bus interests favored the regulation.

The independent bus interests in New England will oppose the bill unless it is amended to include a grandfather's clause which will protect the interests of independent lines now in operation.

John C. Long, secretary of the traffic planning and safety committee, and Russell Huffman, secretary of the legislative committee, are also leaving for Washington to attend the second annual meeting of Secretary Hoover's National conference on street and highway safety March 23-25.

Public Sees Value of Stricter Credit

G.M.A.C. President Says Buying Economies Earn Support —Dealers' Receptive

NEW YORK, March 18—Two important factors are noted by C. C. Cooper, president of General Motors Acceptance Corp., as making for improved conditions in the field of automotive credits. The first of these is the growing appreciation of the public that conservative credit terms make for economies in purchasing. More important, however, he declares, is the reaction among dealers toward the more conservative terms, experience pointing the way toward ultimate welfare instead of temporary advantage.

Evidences of the changing conditions are plentiful, he declares, so much so as to establish the future soundness of the instalment system as applied by those who hold the interests of the automotive industry as their own. The situation, Mr. Cooper says is more reassuring than at any time in the past two years. "The merchandising of automobiles will progressively respond to the application of more scientific selling methods," he declares, "which means that waste will be eliminated; waste including excess credit as well as inefficient and costly methods and practises."

Inefficiency Adds Cost

Concessions in terms and credit practises by finance companies in the recent past, with resultant higher costs and charges, if carried to their logical extreme would virtually result in acceptance of instalment obligations on an actuarial or insurance basis, rather than from a definite credit analysis of each individual transaction, he declared. These methods cannot endure, Mr. Cooper said, finance companies now working toward reducing charges by placing their operations on a scientific basis. Inefficiency cannot be supported further by unreasonable levy on the car buyer, he said.

Manufacturer support has had much to do with the development of a more conservative credit situation, Mr. Cooper declared. Control of production has made it possible to prevent dealer overstocking, a condition which in the past was responsible for unsound credits, he said. Manufacturing effort today is to keep dealer stocks in proper relation to current demand, thereby preventing accumulation of stocks which might have to be moved through unfavorable concessions.

Picture Future of War and Peace Aircraft

PHILADELPHIA, March 17—A symposium held last night at the Bellevue-Stratford Hotel here to discuss the possibilities of airplane transportation was addressed by Capt. G. W. Steele, of the Lakehurst Air Station, Major General Sir Sefton Brancker, director of civil aviation in the British Air Ministry, C. M. Keyes, president of the Curtiss Aeroplane & Motor Co., Inc., Col. Paul Henderson, former assistant postmaster general in charge of the air mail and at present general manager of the National Air Transport, Inc., and W. B. Stout, of the aircraft division of the Ford Motor Co. and late technical adviser to the Aircraft Board in Washington.

Capt. Steele and Sir Sefton sketched an air system of the future which would circle the globe, and pictured an airship thrice the size of the "Shenandoah." Mr. Keyes spoke on "The Present and Future of American and Foreign Air Mail Services"; Mr. Stout on "Heavier-than-Air Craft," and Col. Henderson on "Airways and Airdromes."

Velie in Production on New "60" Sedan

MOLINE, ILL., March 16—In an announcement of a new model 60 sedan, selling at $1450 f. o. b. factory, the Velie Motor Co. states that production is well under way and that shipments are going forward.

This car is finished in weather-resisting high lustre lacquer of gray, contrasting with kingfisher blue in the belt panel, with moldings and stripings to match. Fenders and running board aprons are finished in baked black enamel. Specially designed cushions and back springs improve the riding qualities.

Standard equipment includes bullet lights, robe rails, foot rest, automatic windshield-wiper and rear-view mirror. Lights are controlled from the steering wheel. There are locks for all doors and the instrument board has a 3-unit panel on which are mounted a speedometer, ammeter, oil gage and concealed lights. Lockheed 4-wheel hydraulic brakes and 32 x 6 balloon tires are standard equipment.

The crankshaft is extra heavy. Other features are force-feed lubrication, increased cooling capacity, larger bearing surfaces, an improved manifold, longer connecting rods and pistons and a larger carburetor.

A.E.R.A. to Hold Meeting and Show

CLEVELAND, March 17—The 40th Annual Convention of the American Electric Railway Association, and the manufacturers' exhibit to be held in connection with it, will open here Oct. 4, 1926, and will continue through Oct. 8.

Both floors of the Cleveland Public Auditorium and the entire Cleveland Public Auditorium Annex will be used for the manufacturers' exhibit. In addition, 7200 sq. ft. will be available in out-door space, as well as 1500 lineal feet of track space for display of all kinds of cars and rolling equipment.

Business in Brief

Written exclusively for AUTOMOTIVE INDUSTRIES *by the Guaranty Trust Co., second largest bank in America.*

NEW YORK, March 18—The security markets exhibited a considerable degree of firmness last week, following the drastic decline of a week earlier. Commodity prices, however, continued to move downward. General business activity was in good volume, both wholesale and retail trade comparing favorably with the level of a year ago.

BUILDING CONTRACTS

Building contracts awarded last month in 37 states, according to the F. W. Dodge Corp. had a total value of $389,899,800, which is 15 per cent below the total for January, but 25 per cent above that for February a year ago, and is the highest February figure on record.

FOREIGN TRADE

Merchandise exports last month, according to the preliminary figures, totaled $353,000,000 and imports $389,000,000, as against $397,000,000 and $417,000,000 in January, and $371,000,000 and $334,000,000 in February last year. The excess of imports, amounting to $36,000,000, brings the total import surplus for the year to date to nearly $56,000,000.

CAR LOADINGS

Car loadings in the week ended Feb. 27, a holiday week, numbered 912,658, comparing with 931,743 in the preceding week and 864,096 in the corresponding period last year. Loadings for the year to date total 8,108,459, as against 8,079,996 a year ago.

BANK DEBITS

Bank debits to individual accounts reported to the Federal Reserve Board for the week ended March 10 were 9.2 per cent below the total for the preceding week, but 17.6 per cent above that of a year earlier.

FISHER'S INDEX

Fisher's index of wholesale commodity prices stood at 153.3 last week, as compared with 154.0 in the preceding week, and 158.6 four weeks earlier.

FEDERAL RESERVE STATEMENT

Bills and securities held by the Federal Reserve banks declined $48,900,000 during the week ended March 10, with decreases of $80,800,000 in discounts and $2,100,000 in open market purchases, and a gain of $33,900,000 in Government securities. Note circulation declined $3,600,000 and deposits $21,000,000, while reserves increased $37,300,000. The reserve ratio rose from 73.2 to 74.6 per cent.

MONEY

The rate on call loans was lower at 4 to 4½ per cent last week, as against 4½ to 5½ per cent a week earlier. Rates on time loans and commercial paper were unchanged at 4¾ to 5 per cent and 4¼ to 4½ per cent, respectively.

Automotive Steel Demand Increases

Purchasing Agents Not Ready, However, to Make Long-Range Commitments

NEW YORK, March 18—While steel market developments are not such as to engender among producers hopes of early swings in their favor, they appear to be making considerable headway in lowering costs, or, what amounts to the same thing, attaining increased output without augmenting their labor forces.

Automotive demand is on the upgrade, but steel company sales managers continue to grumble about the refusal of automotive purchasing agents to commit themselves for long-range deliveries.

Both domestic and foreign steel rail orders and structural steel lettings help to give the market, as a whole, a somewhat brighter appearance than the industrial routine demand would warrant.

Sheet Bars at $36

Full-finished automobile sheets are firm at 4.40c, Pittsburgh, and rollers of body stock are well provided with orders. The semi-finished market appears to have settled on a $36 basis for sheet bars.

Steel producers are taking more and more notice of foreign competition. So far, most of the steel arrived here consists of steel bars and lighter structural material, but the potential competition of Europe with American producers in their home market for other steel products is ever-present as a menace, and voices for better protection under the customs act are becoming louder and louder. The smaller blast furnaces are especially wrought up over the relatively heavy tonnages of pig iron that reach Atlantic seaboard ports from the other side. Steel bars of European origin have been sold in the New York market lately at prices considerably under those in vogue in the domestic market, although the aim of the foreign shippers and importers is to obtain a price just as close to that for domestic steel as is possible.

The Metal Markets

Pig Iron—Automotive foundries are reported to be buying somewhat more liberally. The market is easy. Eastern pig iron producers will approach the Senate committee appointed to look into pig iron duties with a view to having the present tariff of 75c per ton augmented.

Aluminum—The steamship "Bremen", in from Germany last week, had a relatively heavy tonnage of aluminum in her cargo, and Germany is becoming a more active factor in the local market. The fact that aluminum production in the United States in 1925 remained virtually stationary, whereas imports increased 48 per cent, is not attributed in the trade to the lack of waterpower in the eastern states, as intimated in the Government report, but to the much heavier importations by the domestic producer who naturally filled much of his requirements with foreign, instead of domestic material.

Copper—Although output is slightly on the downtrend, the market is no more buoyant, just about holding its own.

Tin—Abnormally high levels continue. Spot metal is tight.

Lead—Lead has become relatively cheap, but, as usual, when it is cheap, buyers are out of the market.

Zinc—Following further dips, the zinc market rules rather dull.

New Name Proposed for Moon Light Six

ST. LOUIS, March 15—"A great many rumors have come into the Moon factory recently in regard to a new type of car which Moon is preparing to put on the market," said Stewart MacDonald, president of the Moon Motor Car Co. "In the first place, the car will not be brought out until early in the summer, instead of early spring, as was first reported. In the second pace, it will be an entirely different type of car from the present Moon six, Series A.

"The new six is a lighter car of shorter wheelbase, and, while it will be built with all the individual characteristics of high-class luxury and performance that characterize both Moon and Diana, it will be a car considerably lower in price and built to meet competition in the $1000 class. It will not be known by the name Moon and will have an entirely new radiator of different lines and contour.

"There is no intention of abandoning the present Moon six, which is now in its fourth season," Mr. MacDonald concluded.

Foreign Journalists Will Inspect Car Industry

WASHINGTON, March 15—What the automobile has done for America and its relation to highways will be graphically shown to editors from Latin American countries who will convene here on April 7 for the first Pan-American Congress of Journalists.

Following the congress, which will last six days, the delegates will be taken on a tour of the eastern and northern central United States.

Accompanied by representatives of the National Automobile Chamber of Commerce and the American Automobile Association, the delegates will spend several days in Detroit, inspecting the automobile industry, later going to Akron.

Hayes Stockholders Increase

JACKSON, MICH., March 15—The number of stockholders of the Hayes Wheel Co. at the end of February numbered 327 preferred and 1101 common, as compared with 246 and 1211 at the same time in 1925.

Production of wheels in 1925 totaled 1,067,988 sets, against 962,017 in 1924.

Peugeot to Show Heavy-Oil Engine

Works on Two-Stroke Cycle and Burns Crude—Compression 300 lbs. p. sq. in.

PHILADELPHIA, March 17—As noted in a recent issue of *Automotive Industries*, several officials and engineers of the Peugeot Automobile Co. of Lyons, France, are now on their way to this country, bringing with them samples of the Tartrais heavy-oil engine, which created a considerable stir in Europe when it was first brought out. The engine has been under development for several years and is said to have now reached a stage where quantity production can be begun.

This engine works on the two-stroke cycle and burns crude oil and similar fuels. Toward the end of the expansion stroke the burnt gases escape through a port in the cylinder wall uncovered by the piston, and a moment later the piston also uncovers a scavenging port, and a scavenging pump then blows air through the cylinder, sweeping out the burnt gases and filling the combustion chamber with air.

Ignition System Details

During the upstroke, this air is compressed to about 300 lbs. p. sq. in., into a hot-bulb type of compression chamber located in the cylinder-head. This chamber is surrounded by a cover, but is not water-jacketed. At the end of the compression stroke, fuel is injected into the compression chamber by means of a fuel valve located centrally in the head. In starting, ignition is effected by means of an electrically heated coil carried by a plug similar to a spark plug, which screws into the wall of the combustion chamber, while in regular operation ignition is spontaneous by the heat of compression combined with the heat of the combustion chamber wall.

The compression space is entirely within the head or hot bulb, which communicates with the cylinder proper through a neck, and as the piston is formed with a central extension which extends a short distance into the neck, a high degree of turbulence is created in the compression chamber at the end of the compression stroke.

Cadillac Builds Final Unit

DETROIT, March 15—With the breaking of ground this week for the new administration building of the Cadillac Motor Car Co., work has been begun on the last unit of the factory as it was originally planned.

The new building, which will cost about $600,000, is to be the finest of the group of factory buildings located in the center of the main quadrangle, facing Clark Ave. It will have a frontage of 312 ft. and a depth of 54 ft., and has four stories and a basement. Behind it will be a glassed-over garage 607 x 275 ft.

Car Fatalities in 1925 Total 19,828

N.A.C.C. Reports 10 Per Cent Increase Over Previous Year

NEW YORK, March 15—Automobile fatalities in 1925 numbered 19,828 or 10 per cent more than in 1924, according to the National Automobile Chamber of Commerce, whose figures are based upon reports from communities comprising 83 per cent of the population of the country. The figures for the remaining 17 per cent are estimated on a pro rata basis.

The total represents actual fatal accidents as defined by the United States Census Bureau. It does not include cases where the automobile is involved in street car or railroad accidents, since these are attributed by the census to the heavier vehicle. Neither does it include other highway accidents unrelated to automobiles.

Three States Show Reduction

New York, Minnesota and Oregon reduced the number of accidents in 1925. The Empire State reduced its total 10 per cent, against the 10 per cent increase for the entire country. This was accomplished through a strong state law, including revocation of licenses of careless drivers; efficient law enforcement; cooperation of cities with state authorities; vigorous policing of state highways; engineering progress in road construction and street traffic control; and newspaper aid in publishing lists of license revocations.

Fifteen cities of more than 100,000 population have also won places on the safety honor roll: Pittsburgh, Los Angeles, Buffalo, San Francisco, Washington, New Orleans, Minneapolis, Denver, St. Paul, Birmingham, Syracuse, New Haven, New Bedford and Cambridge, Mass., and Kansas City, Kans.

Encouraging Features

"The 10 per cent increase is a challenge to other American cities," says George M. Graham, chairman of the Traffic Planning and Safety Committees of the N. A. C. C. "The fact that vehicle registrations increased 12.7 per cent while fatalities increased 10 per cent is no palliation, but there are two encouraging factors—that three great states and 15 large cities have shown that they are meeting this situation and that each year we have increasingly complete and prompt records by which to check performance. At no time in the past have records been available from 83 per cent of the communities within two months after the close of the year. This shows the increasing scientific approach to the situation and gives promise that this problem will be handled with increasing efficiency."

New York state registrations increased 14.3 per cent, but fatal automobile accidents fell from 2316 to 2120. It is estimated that 28 per cent of the country's total automobile fatalities involved children and 60 per cent of all persons killed were pedestrians. Speed, violation of road rules, and inattention continue to be the chief faults of the motorist, while jay-walking of adults and playing in the street by children are the predominant causes for fatalities where the blame is charged to the pedestrian.

The committee recognizes that much preventive work can still be done in the elimination of sharp corners, poor street lighting, abrupt curves, narrow streets and other engineering factors which increase accident probabilities.

Gorrell Foresees Large Car Sales

INDIANAPOLIS, March 15—E. S. Gorrell, vice-president, Stutz Motor Car Co. of America, Inc., predicts a healthy spring peak in automobile production, merchandising and buying on the part of an interested public and bases his opinion upon tangible facts evidenced from the automobile shows held throughout the country.

"New England's big show, which brought to an end the so-called national shows of the country, convinced me that the buying power of the country is terrific, providing one can anticipate or lead its demands," said Mr. Gorrell.

"Upon my return from Boston I found that we had shipped as high as 28 cars in one day; that we had shipped 68 cars the previous week, and, at the close of business prior to Boston, had actually shipped 471 cars since the first of the year.

"Now we have unfilled orders for nearly 3000 cars and the demand for immediate deliveries is unprecedented in the price class of our car.

"We have started Bert Dingley, our service manager, with a relief driver on a 7000-mile trip covering Chicago, St. Louis, Kansas City, Tulsa, Dallas, El Paso, Phoenix, Los Angeles, San Francisco, Salt Lake City and Denver, to give service talks and demonstrations.

"Charles S. Crawford, our chief engineer, has started for Los Angeles for a few days' respite—the first in twenty-two years—now that we have the production line moving smoothly with capacity output. But we at the factory are doubling up—as many others in the industry are doing at this time—to meet the demand which I claim will mean a wonderful spring peak in things automotive."

Hupp Exports to Exceed 1925 by 50 Per Cent

DETROIT, March 17—Export shipments of Hupmobiles for the last five months exceed those for any corresponding period in the history of the Hupp organization. According to Fred B. Sides, they are 82 per cent larger than shipments for the corresponding period a year ago.

The company, Mr. Sides says, expects its 1925 export figures to be exceeded by at least 50 per cent in the present year.

Plan 29,000 Miles New Roads in 1926

$1,030,286,948 Available for Building and Maintenance This Year

WASHINGTON, March 18—Highway construction and maintenance in 1926 will equal and possibly exceed the progress made in any other year, according to estimates from the various states, compiled by the bureau of public roads of the U. S. Department of Agriculture. A total of $1,030,286,948 is available for construction and maintenance of all rural roads.

Fifty-eight per cent, or $598,590,948, is to be available to the State highway departments, of which $461,515,400 is for construction and $137,075,548 for maintenance. These funds will provide for the construction of 6751 miles of asphalt, concrete and brick paving, 14,320 miles of sand-clay, gravel and macadam and 8145 miles of improved earth road. The states also plan to maintain 234,582 miles of road.

The total expenditure by counties and local units for both maintenance and construction is estimated at $431.696,000, which is less than the similar estimate made one year ago by about $31,000,000. This reduction is more than offset, however, by the increase of more than $58,000,000 in funds estimated as available to the State highway departments. For a number of years there has been a trend toward placing control of all important state roads in the hands of the state highway departments.

Russians Coming in April to Study at Ford Plant

WASHINGTON, March 15—Fifty Russian workers, mechanics and students will come to the United States in April to enter Henry Ford's factory for a course of training in the building and running of Fordson tractors, of which the Soviet Government recently purchased 10,000 units, the Automotive Division of the Department of Commerce learns through consular dispatches from Moscow. The Ford company will pay their railway and steamship fares to and from America and their salaries while they are learning, but they must pay their own living expenses.

The first group comprises a number of workers from the Putilov Iron Works at Leningrad, which is producing Russian tractors of the Fordson type. The Ford company has undertaken to send some of its expert instructors to Russia.

STAR SALES UP 95%

NEW YORK, March 16—Colin Campbell, vice-president, Durant Motors, Inc., announces that factory sales of Star cars in February exceeded Feb., 1925, by 95 per cent.

Sloan Sees Dealers with Normal Stocks

NEW YORK, March 16—Continued prosperity in the automobile industry is expected by Alfred P. Sloan, Jr., president, General Motors Corp. With first quarter business exceeding the most optimistic expectations of leading executives earlier this year, Mr. Sloan finds every indication pointing to a record spring demand for cars. He does not see any indication that manufacturers are over-stocking dealers, and he adds that only normal provision is being made in production schedules to meet the anticipated large volume of business.

General Motors, says Mr. Sloan is adhering closely to its policy of holding production in line with the retail demand. Increases in production schedules so far this year have been in accordance with increases in public buying. He describes General Motors stocks of cars in the field as conservative, when compared with current demand, and manufacturing has been planned so that the divisions will enter the spring selling season with about one month's supply, or less, on hand.

Retail sales of General Motors cars, he adds, are running from 50 per cent to more than 100 per cent over 1925, but he points out that sales to consumers in the first quarter last year were held down because the Chevrolet division did not have enough cars in the territory to meet the demand. He also points out that the 1925 first quarter was not particularly good because the industry was recovering from the 1924 recession.

Large sales now being enjoyed, according to Mr. Sloan, are caused almost wholly by recognition that the industry is giving the greatest possible value for the dollar, with the automobile of today representing an outstanding bargain to the purchaser as compared with other articles he commonly buys.

"The industry's soundness is fundamental," he adds. "Its financial position has been improved, its manufacturing methods are more efficient, and its sales appeal is legitimately based on value and service. There are no evidences in the trade of the excesses which have accompanied previous periods of heavy volume or boom periods. The industry is becoming more stabilized than at any time in its history, and it is following normal lines of expansion. Its leaders are developing policies which can stand up under the test of good business."

Traffic Managers to Meet

NEW YORK, March 16—Traffic managers of member companies of the National Automobile Chamber of Commerce will meet in the General Motors Bldg., Detroit, on March 25.

There will be a discussion of carload automobile shipping, railroad consolidation, the railroad labor bill, end door car requirements, Florida shipping permits, new efforts toward dunnage allowances, and reports on long and short-haul bills before Congress.

Equipment Sections for National Shows

(Continued from page 504)

section as an added attraction and wide promotion of this feature, larger trade patronage could be obtained.

The service equipment manufacturers also favored utilizing the National shows to bring the subject of improved service with adequate equipment to the attention of the motoring public, believing that this would contribute to the general satisfaction in motor car and truck use and promote sales of cars, trucks, and other automotive products as well as service equipment itself.

It is intended to have the service equipment sections open only to the trade during the early part of the day, making it convenient for manufacturers to demonstrate and equipment users to study the machinery on exhibit. In the evening this part of the show will be open for the education of the general public.

Mr. Miles will have the cooperation of interested service equipment makers, the car manufacturers' service executives and their organization in the N. A. C. C. and the M. & A. M. A. in developing between now and fall the plans for the specialized exhibits at New York and Chicago.

It is also expected that the service equipment section will be provided in the Boston show.

Developments of the Week in Leading Motor Stocks

NEW YORK, March 17—Automotive shares have shown fairly consistent strength of late, and the gains made in more than one instance have been rather striking, considering the desultory character of the stock market movement. This is the time of year when Wall Street begins to look for a rise in the motors, and although the group is at a much higher average than at the same period a year ago, the financial community believes that there is justification for a spring advance.

This feeling is based on the thought that the overbought condition of last fall has been thoroughly liquidated, and the technical position of the automotive securities thereby enhanced. Added to this are the financial reports of the leading companies lately issued, revealing a remarkably strong position and basis for profitable action in favor of stockholders, and the current high rate of production and sales. On the basis of prospective first-quarter earnings, speculative optimism certainly appears justified.

As an instance of the attractive possibilities seen in many of the motor shares, General Motors is frequently referred to. This company will earn its full year's dividend requirements in the first quarter, and the outlook for extra disbursements later in the year is correspondingly regarded as most favorable. The statement of President Sloan that sales to the public were at record levels and that stocks in dealers hands were no more than normal was regarded as decidedly "bullish."

New Viewpoint Toward Motor Stocks

The manner with which the automotive industry has managed its worst problems in the last eighteen months, observing sound production policies and avoiding price-cuts below a reasonable profit basis, has undoubtedly built up the confidence of many investors, as well as the speculative factions, and it is inevitable that the new viewpoint toward motor stocks should be reflected in market averages and movements.

Some of the most notable gains registered have been in the shares of equipment makers, including Stewart-Warner and Stromberg Carburetor. As pointed out two weeks ago in this letter, these stocks appeared to be undervalued in market quotations. Fisher Body, as usual, moved upward in sympathy with General Motors, presumably because the body company is sharing in the activity of the car manufacturer.

Tire shares for the most part moved only fractionally. The Street is evidently still waiting to learn just how the companies will be affected by the drop in prices of rubber and tires. It would appear that the companies will be in better position than ever, unless drastic price reductions in tires are made. There might then be some difficulty with stocks of crude bought at higher levels than those prevailing in recent weeks, but it is generally believed that such stocks are by no means heavy.

The Jordan Motor Co. issued its report on operations for the year 1925 which proved somewhat disappointing, as earnings were lower than in 1924. This stock has been actively exploited in recent weeks on the marked recovery in business this year. In connection with the annual report the management stated that the company's production in the first quarter of the year was 300 per cent above 1925 and that dollar sales volume had increased 50 per cent with all indications that the entry of the company into the eight-cylinder field would result in record-breaking profits.

Another speculative influence on the motor and accessory shares was the return of W. C. Durant to his office for the first time since he was injured in a train wreck in Florida several weeks ago. There was heavy speculative buying of several stocks in which he is understood to be interested.—E. S.

Jordan Reports Net Profits of $790,475

Company's New 8-Cylinder Line Meant Establishment on New Basis in 1925

CLEVELAND, March 16—Jordan Motor Car Co. reports for 1925 net profits of $790,475 before depreciation and taxes, equivalent, after preferred dividends, to $5.60 a share on 126,000 no par common. This compares with $858,469 in 1924, or $6.14.

Cash and Liberty bonds on hand Dec. 31, 1925, totaled $628,509, compared with $615,963. Current liabilities aggregate $1,252,382, compared with $377,970. Total assets amounted to $4,404,366 while profit and loss surplus was $2,157,536.

Cars Show 300% Increase in Number

Says the report, referring to the Jordan 8-cylinder line:

While the attendant expense and delay in production entailed by this important move, which practically meant the establishment of the business on a new basis and in a new field, was considerable, and affected the showing for the twelve months' period of 1925, the fact that Jordan will show an increase of 300 per cent in numbers of cars, or from 1136 during the first three months of 1925, to 3508, which will be the total for the first quarter of 1926; and 50 per cent increase in volume, or from $2,311,632.60 for the first quarter in 1925, to $3,630,911.33 for the corresponding period in 1926, indicates that Jordan is entering upon a period of prosperity which will make the year 1926 the biggest year in the history of that company.

The introduction of the new low-priced eight involved the equipment of a new plant for painting and trimming bodies, a doubling of the number of men on the payroll, and all of the attendant expense incident to the starting of a new business. In spite of this, Jordan still maintains a strong financial position, with no bank loans, or other obligations.

Car Insurance Hearings Set for Next Oct. 4

NEW YORK, March 17—The Supreme Court at Washington on Oct. 4 will hear the appeal brought by the Chrysler Sales Corp. and others to test state laws, which, according to state insurance commissioners, prohibit placing fire and theft insurance on automobiles sold on time payments, unless offered through licensed state agents of insurance companies.

Rolls-Royce Buys Company

SPRINGFIELD, MASS., March 17—Rolls-Royce of America, Inc., has acquired the lamp works and organization of the Elliott Mfg. & Plating Co., of this city and incorporated them in its factory at East Springfield.

For some time, the Elliott concern has manufactured the solid nickel-silver lamps for the Rolls-Royce cars, but under the new policy all lamp work will be done in the Rolls-Royce establishment.

The Elliott company, established several years ago by John T. Elliott, who came here from the lamp works in Amesbury, Mass., has been discontinued. Winfred C. Eastman, who was president and manager of the Elliott concern, has been put in charge of the new department for Rolls-Royce.

Would Remedy Evils in Trade Practices

WASHINGTON, March 18—The Chamber of Commerce of the United States today announced the setting up of machinery for the elimination of trade abuses and uneconomic trade practices, marking a further step toward the eventual self-government of business. The appointment of a permanent Committee on Trade Relations to serve as the focusing point for all activities in this direction has been authorized by the board of directors of the national organization.

Representatives of wholesaling, retailing, manufacturing and the consuming public will comprise the new committee.

This action is in response to a recommendation made by the National Distribution Conference.

The committee, it is intended, will serve in the first instance as a clearing house for information relating to the adjustment of trade disputes and the supression of trade practices detrimental not only to the merchant and the manufacturer but to the consuming public.

The first task of the committee will be to promote the setting up of the necessary machinery within the various trades to facilitate the adjustment of disputes between manufacturers, wholesalers and retailers in a particular trade.

Mason to Copeland Products

DETROIT, March 17—G. W. Mason, general works manager of the Chrysler Corp., has become associated with the Copeland Electric Refrigeration organization as general manager, according to announcement by W. R. Wilson, president of Copeland Products, Inc.

Mr. Mason was formerly with Dodge Bros., Inc., the American Auto Rim Co., as assistant general manager, the Irving National Bank of New York, and the Maxwell Corp.

Darnell with Flint Co.

DETROIT, March 16—R. C. Darnell, who recently resigned as assistant engineer of the Northway Motor Mfg. Co., has joined the Flint Motor Co. as motor engineer.

Hotchkiss Back from Europe

NEW YORK, March 15—H. Stuart Hotchkiss, vice-president of the U. S. Rubber Co., has returned from a European trip.

Tire Production to be Speeded Up

Revival in Retail Trade Gives Promise of Improved Conditions in Trade

AKRON, March 17—With the spring motoring season now getting under way, after one of the severest winters in years, Akron tire manufacturers are preparing to increase production in response to a revival in retail business all along the line.

Tire production declined about 20 per cent in February, bringing the total output for the district to approximately 100,000 casings and 120,000 tubes a day, compared with previous levels of 125,000 casings and 140,000 tubes a day. The curtailment was brought on largely by the violently fluctuating crude rubber market and by the tire price cut of Feb. 1, which tended to destroy the confidence of dealers in the market.

Larger Volume of Orders Ahead

A survey of the leading factories this week shows a marked improvement in the situation. For the first time in six weeks, sales of tires to dealers were greater than the preceding week. Sales managers and branch representatives, furthermore, noted a lessening in sales resistance in their territories, and express the view that orders will be received in larger volume from now on.

The best gains are being made in sales of the so-called "second grade" tires. The Goodyear and Goodrich companies, largest producers of these tires, have recently added to their lines of "Pathfinder" and "Radio" cords, and "Usco" tires of the U. S. Rubber Co., which are in practically the same class, are reported to be meeting with greater favor in the trade.

While no material changes have yet been made in production schedules, it is learned that tickets will be larger next week in several of the larger factories. The major tire plants did not curtail their operations as much as their smaller competitors. They were able to keep up production at fairly satisfactory levels, because of a good volume of original tire equipment orders. Bus tire business has also been good this winter.

Most of the smaller tire companies, which had no original equipment business, have been operating on three and four-day-a-week schedules.

Thomas Still with Reo

LANSING, March 15—H. T. Thomas, vice-president and chief engineer of the Reo Motor Car Co., and one of the best known men of his profession in the industry, is taking a holiday in Florida. His absence from the plant gave rise to rumors recently that he had resigned, but the reports were entirely incorrect. Mr. Thomas is still active in the Reo company, and his friends hope he will continue to be for many years to come.

Mack Trucks Gross Sales Show Big Gain

Increase of $22,289,562 in 1925 Over Previous Year—Earns $13.62 a Share

NEW YORK, March 16—Gross sales of Mack Trucks, Inc., and subsidiaries in the calendar year 1925 were $68,912,183, against $46,622,621 in 1924. After depreciation and reserves for Federal taxes, net profit was $9,468,269, against $6,220,272 in 1924, equal, after preferred dividends, to $13.62 a share earned on 611,515 shares of no par common stock in 1925, against $17.95 a share on 283,109 outstanding in 1924.

After preferred and common dividends, $6,273,888 was carried to surplus, capital surplus at the end of 1925 standing at $19,289,936.

Current Assets, $45,399,169

As of Dec. 31, 1925, current assets, including cash, $5,577,100; inventories, $25,914,355; and $7,545,833, due from Mack Acceptance Corp., stood at $45,399,169, against current liabilities of $7,271,687.

In the report, A. J. Brosseau, president, says in part to stockholders:

"During the year your directors authorized plant extensions at Allentown, Plainfield and New Brunswick. These extensions will be completed during 1926, making it possible for your company to take care of a greater volume of business than ever before. Your directors also authorized the erection of new service stations at Chicago, Jersey City, New Haven, Bridgeport, Worcester, Albany, White Plains, Camden, Baltimore, Tampa, Minneapolis and St. Paul.

"Your company's growth, while proceeding at an extremely rapid rate, is, nevertheless, normal and thoroughly sound, and has been carried on in an orderly manner. The plants are working at full capacity. Orders on hand, and the prospects for next year, justify your officers in forcasting a continued increase in business."

McCord Radiator Doubles Last Year's Production

DETROIT, March 17—The McCord Radiator & Mfg. Co., through its president, A. C. McCord, in its annual statement to stockholders stated that the company had completed the construction, undertaken in 1924, involving a complete new lay-out of the plant and the equipment of National Radiator & Mfg. Co., acquired in 1925.

Production of radiators in January and February this year had been practically doubled, it was said, and this had enabled the company to meet almost overnight demands for increased output, which could not have been met under the former conditions. It was further stated that reductions in cost were beginning to accrue.

"Another important factor," said Mr. McCord, "has been the great increase in the volume of our merchandise department, which, to a large degree, is independent of our regular line of business with the automobile manufacturers. This covers the manufacture and sale of copper gaskets, cork gaskets, lubricators, replacement radiator cores for practically all of the principal makes of cars."

Austin Motor Co. Soon to Reorganize

LONDON, March 15—A reorganization plan of the Austin Motor Co. has been completed which contemplates the reduction of the capital from £5,000,000 to £3,500,000. The par of the £1 preferred stock is to be cut to 8s, and the par of the £1 common, to 5s.

Dividend arrears on the 7 per cent cumulative preferred and the 6 per cent "B" preferred to Sept. 30, 1925, is to be cancelled. Holders of the 7 per cent cumulative preferred will receive 5 per cent "A" cumulative certificates, and the 6 per cent "B" preferred will get similar "B" certificates.

Goodyear of California Declares 14% Dividend

LOS ANGELES, March 17—The Goodyear Tire & Rubber Co. of California, has declared a dividend of 14 per cent on the preferred to pay off accumulated dividends from April 1, 1922, to Jan. 1, 1924. The regular quarterly dividend of 1¾ per cent was also declared on the preferred. On Jan. 2 of this year a distribution of 1¾ per cent was made on the preferred on account of arrears.

Central Steel Co. Sales Increase $5,996,757

MASSILLON, OHIO, March 17—The Central Steel Co. reports, in its earnings account for 1925, total net earnings of $3,374,094.67, which, after providing for common and preferred dividends, leaves balance to profit and loss account of $1,899,864.35.

Total sales for 1925 totaled $36,674,613.04, compared with $30,677,856.27 in 1924, or an increase of $5,996,756.77.

Huff-Daland Capital Increase

OGDENSBURG, N. Y., March 15—Huff-Daland Airplanes, Inc., announces that this company's capitalization will be brought up to $1,000,000, but that the new stock will not be offered for public sale.

The building program of the company for 1926 calls for 250 airplanes of military and commercial types.

GMAC Plans New Branch

NEW YORK, March 17—The General Motors Acceptance Corp. has applied to the New York State Superintendent of Banks for permission to establish a branch at Port Elizabeth, Union of South Africa.

Financial Notes

Lee Rubber & Tire Corp.—This company for 1925 announces $300,209 net income, or $1.39 a share on outstanding capital stock, compared with a net loss of $234,472 in 1924. Net sales last year were $12,742,585, an increase of $157,000, while the company effected savings of about $361,000 in operating costs, materials, etc.

As of Dec. 31, 1925, current assets were $7,988,719 and current liabilities $4,367,303. The company has provided for approximately $1,000,000 additional working capital through increasing capital sock by offering to stockholders the balance of the authorized stock, of which there are now 300,000 shares outstanding.

Akron Rubber Reclaiming Co.—This company announces that a special stockholders' meeting has been called for April 3 to vote on increasing the capital stock from $500,000 to $1,000,000.

It was stated that the company planned to double its output this year.

Bearings Co. of America—Brooke, Stokes & Co., of Philadelphia, is making a public offering of a new issue of $1,750,000 of this company's first preferred cumulative sinking fund stock. The stock is offered at $100, and each preferred share carries a bonus of one-half share of common.

American Rubber & Tire Co.—This company has made arrangements to float a bond issue of $500,000 to pay off current debts and enable the company to expand its business. The bonds will be retired by 1936, and will bear interest at 6 per cent.

Motor Products Corp.—This company has declared an initial quarterly dividend of 50 cents on its new common shares, and a quarterly payment of $1.25 on the preferred, both payable May 1 to holders of record of April 20.

Pierce-Arrow Motor Car Co.—This company has notified the New York Stock Exchange of a proposed reduction in the authorized capital stock by the retirement of 15,750 shares of the prior preference issue.

Jordan Motor Car Co.—This company has declared the regular quarterly dividend of 75 cents on the common and 1¾ per cent on the preferred, both payable March 31 to stock of record of March 16.

Auburn Automobile Co.—This company has declared an extra dividend of $1.00 and the regular quarterly dividend of 75 cents, both payable April 1 to stockholders of record of March 25.

Yellow Truck & Coach Mfg. Co.—This company has declared the regular quarterly dividends of 18 cents on Class B and 1¾ per cent on preferred, payable April 1 to stock of record of March 20.

National Lead Battery Co.—This company announces an increase from $500,000 to $1,000,000 in its capital stock.

Rubber Consumption in February Down

Yet Figure of 31,135 Tons Exceeds Estimates—Prices Erratic

NEW YORK, March 15—Prices on the rubber market in the last week have been very erratic but somewhat higher, due to nervous shorts at London and the reported buying on the part of manufacturers.

The report that crude rubber consumption in February was 31,135 tons, against estimates of from 25,000 to 27,000 tons, was a surprise to the trade, and also to those, including the House Committee on Interstate and Foreign Commerce, who are emphasizing the effect of the rubber conservation campaign. The 31,135 tons were only 1059 tons less than January consumption and 2498 tons more than December consumption.

February Imports Decline

February imports, according to the Rubber Association of America, Inc., were 34,067 tons, a decline of 4630 tons from the January figure. Henderson, Helm & Hammersfahr, Inc., reports imports for the first half of March as 11,848 tons, and stocks on hand and afloat on March 1, 104,970 tons, compared with 101,497 tons on Feb. 1. Shipments from the East for America in March are estimated at 32,000 tons.

Trading on the Rubber Exchange of New York established a new record—1045 tons last Friday. Excess of February consumption over estimated figures had a bullish effect in New York and London, May reaching 63.60 cents, and July, 62.50 cents.

According to the Henderson firm, reports from manufacturing centers indicate that tire sales are still unsatisfactory, dealers not taking advantage of spring dating, but continuing on the basis of hand-to-mouth buying. Chicago and vicinity report tire sales running more than 20 per cent behind this period last year, with Middle West weather still unfavorable, and distributing stations and warehouses carrying full stocks.

Glancy Predicts Pacific Coast Assembly Plants

PORTLAND, ORE., March 17—Prices on automobiles will be materially lowered at Pacific Coast points within the next year, through the establishing of assembly plants in the West, declared A. R. Glancy, president of the Oakland Motor Car Co., who is a Portland visitor.

Within the next 60 days, one of the biggest producers in the industry is expected to announce plans for erecting a Pacific Coast assembling plant, and others will soon follow, Glancy said.

"We have simply got to come to it, as present freight rates on completely assembled cars are excessive. By assembling cars on the Pacific Coast we can reduce freight charges and thereby lower the cost of the finished product for the entire Pacific Coast market."

Mr. Glancy was accompanied by T. E. McMeans, factory sales manager in the Northwest, and one day during their stay here a sales congress was held of Oregon and Washington Oakland-Pontiac dealers.

New Light White Bus Chassis Out

CLEVELAND, March 15—Production of a smaller bus chassis listing at $4250 and suited for bodies ranging from 14 to 21-passenger capacity has commenced at the White Motor Co. plant. Seventeen of the new chassis have been shipped to a western operator, and production is going forward simultaneously with the larger and original White bus chassis.

The new model, known as the 53 Series, follows the general design of the larger chassis using the same four-cylinder power plant and other units. With a standard wheelbase of 180 in., inter-city bus bodies of 14-16 passenger capacity or city service bodies of 21-passenger capacity may be employed.

Unusual riding qualities are claimed for the new chassis, which is provided with 34 x 7.50 in. balloon tires, with duals at the rear and a special type of progressive rear springs. The frame is kicked up over the rear axle giving the chassis a low appearance. A technical description of this chassis will appear in these pages shortly.

Paris Plans Experiment in Underground Parking

PARIS, March 5 (*by mail*)—Underground parking stations are to be tried out in Paris in an effort to relieve traffic congestion. The Municipal Council has decided to offer prizes totaling about $4000 for the most satisfactory plans for underground parking places to be constructed in the centre of the city, near the main line of boulevards. It is believed that these underground stations can be combined with tunnels running north and south, thus diminishing much of the surface traffic on the boulevards running east and west. If this plan is completed no parking will be allowed on the main line of boulevards and it will be forbidden to cross these boulevards in a north-south direction.

It is stipulated that the entrances to these underground pasages shall not detract from the beauty of the city, they must be 39 ft. wide, thus allowing for four streams of traffic, and have a height of 13 ft. The gradient must not exceed 7 centimeters per meter. The passages and parking places must not interfere with present underground constructions such as the subway, drains, electric cable tunnels, etc. Engineers submitting schemes are expected to estimate cost of construction and maintenance.

Higher Compression Discussed by S.A.E.

Detroit Section Hears Sparrow on Automotive Engines and Superchargers

DETROIT, March 15—S. W. Sparrow of the Bureau of Standards was the principal speaker at the March meeting of the local section of the Society of Automotive Engineers, his subject being effect of higher compression in automotive engines. Mr. Sparrow spoke along the lines of his article in *Automotive Industries* of Dec. 10, 1925.

He also made reference to the subject of superchargers, and said that, while they will undoubtedly come into use to a certain extent, they will not be adapted to engines in the low-price classes. The objects aimed at in the use of superchargers are quite different in aircraft and automobile work; in the former, the aim is to prevent loss of power with increase in altitude, while on automobiles it is to increase the power over the maximum otherwise obtainable.

Fuel Testing Questions

Capt. L. M. Woolson, aeronautical engineer of the Packard Motor Car Co., inquired whether or not the Bureau of Standards had developed any new methods of testing fuels other than in single-cylinder engines, to which Mr. Sparrow replied that the single-cylinder method was found to be the most satisfactory way. In reply to another member, Mr. Sparrow said he believed water injection would be beneficial, but that not much experimental work had been done along these lines.

The discussion brought out that the location of the spark plug had a great deal to do with the efficiency of the engine. More severe detonation has been found to result from the use of one plug than when two are employed, while detonation is often due to spark advance.

Softer Front Springs Commended by Leonard

SAN FRANCISCO, March 16—At the second March luncheon of the San Francisco Chapter of the Society of Automotive Engineers, H. R. Leonard, Jr., vice-president of the Watson Stabilator Distributing Co., spoke on the subject of stabilizing tires and springs. Mr. Leonard in his talk ventured the opinion that it was necessary to use softer front springs than at present, or we should always have gallop. He said he preferred six and eight leaves to 12 and 14, as this cuts down the frictional resistance.

The monthly meeting and banquet of the chapter are to be held at the Engineers Club tomorrow evening. Officers of the new chapter are: Edwin C. Wood, chairman; Grahame B. Ridley, vice-chairman; Chas. W. Gebhardt, treasurer, and W. S. Crowell, secretary.

Men of the Industry and What They Are Doing

Robert N. Falge Gets Coffin Foundation Award

Robert N. Falge of the engineering department of the National Lamp Works, Cleveland, has received the Charles A. Coffin Foundation award in recognition of his research work in connection with automobile lighting, and the perfection of the depressible beam system of head-lighting with a two-filament lamp with suitably coordinated lens and reflector element. The corrugated type of bulb was also developed by Mr. Falge.

The importance of Mr. Falge's work is indicated by the fact that in less than a year more than 20 car manufacturers have adopted the twin-filament type of head-lighting equipment.

Dana and Carpenter Directors

The organization formed by the Spicer Mfg. Corp. and E. J. Hardy & Co., Ltd., and known as Hardy & Spicer Co., Ltd., has recently been completed and Edward J. Hardy is to continue as chairman of the board, with Joseph A. Oldbury as managing director. The American directors will be C. A. Dana and R. E. Carpenter. Herbert Clark, representing the Spicer interests abroad for the last two years, will be works manager for the new concern.

B. D. De Weese Resigns

B. D. De Weese has resigned as vice-president in charge of the Kalamazoo operations of the Checker Cab Mfg. Corp., and the handling of affairs will revert to the former management.

Mr. De Weese was formerly in charge of the automotive division of the Kilbourne & Jacobs Mfg. Co., and later was in charge of sales of the commercial axle division of the Columbia Axle Co., of Cleveland, Ohio. His future plans are unannounced.

E. H. Wehrli Resigns

E. H. Wehrli has resigned as chief engineer of the Luxor Cab Mfg. Corp., manufacturer of taxicabs and light delivery cars. Mr. Wehrli was chief engineer of the Rainier Motor Corp. prior to his connection with the Luxor company. He has made no definite plans for the future.

Ackerman Back from Florida

SYRACUSE, N. Y., Mar. 11—Returning from a three weeks' trip to the larger centers of Florida, Sales Manager S. E. Ackerman of the Franklin Automobile Co., Syracuse, pronounced Florida business conditions in a well-settled and healthy state. "This Florida boom," said Mr. Ackerman, "so universally discussed, has subsided to an extent that is satisfying to Florida business men."

Mr. Ackerman reports retail conditions, including automobile retailing, to be excellent.

MANY AUTOMOTIVE OFFICIALS ON COAST

San Francisco was host to a number of men prominent in the automotive industry, and to several important sales conferences during the first week in March.

E. T. Strong, sales manager of the Buick Motor Co., Flint, Mich., made a several weeks' survey of conditions on the coast.

A group of Reo factory officials from Lansing, Mich., headed by C. E. Eldridge, assistant sales manager, on tour of the United States, were the guests of A. Roy Camp, vice-president of the Reo Motor Car Co. of California.

Howell H. Brooks, general director of sales and advertising manager of the Marmon Motor Car Co., spent the week of March 8 with Butler-Veitch, Inc., Marmon distributors for northern California.

A. R. Glancy, president and general manager of the Oakland Motor Car Co., spent the week ended March 6 in conferences with Cuyler Lee, manager of the Western Motors Co., Oakland and Pontiac distributors; Don Lee, Cadillac distributor who has long been indentified with the automotive industry on the coast; and T. E. McMeans, district manager of the Oakland Motor Car Co.

The first White Truck district managers' meeting to be held in the new Pacific coast headquarters was presided over by G. A. Urquhart on March 6.

Murphy a Franklin Director

Ralph Murphy has been elected a director and second vice-president of the H. H. Franklin Mfg. Co., Syracuse, N. Y. He has been connected with the Franklin concern since 1919 and has served as chief engineer, assistant to the vice-president, and works manager.

Blendermann Sales Manager

L. F. Blendermann has been appointed district sales manager at Philadelphia for the Chicago Fuse Mfg. Co., manufacturer of electrical protecting materials and conduit fittings.

L. S. Allen in Charge

The Central Steel Co. has opened a district sales office at 404 W. 1st St., Tulsa, Okla., which will be in charge of L. S. Allen.

W. C. Durant Recovers and Returns to Desk

William C. Durant, president, Durant Motors, Inc., returned to his desk at his office in the Fisk Bldg., New York City, last week for the first time since the railroad accident in which he suffered injuries two months ago.

It is said that, during the entire time of his confinement, including two weeks in the Postgraduate Hospital, New York, he kept in touch with his business affairs, placing stock orders by telephone. For the last month he has been keeping business appointments at his home, 907 Fifth Ave., New York.

Zimmerman Export Manager

Walter Zimmerman, who for the last six months has been engaged in special sales work for the Peerless Motor Car Co., Cleveland, has been appointed export manager of that company, and has opened offices at 615 Fisk Bldg., New York City.

Mr. Zimmerman was formerly connected with the export department of the National Cash Register Co. and the foreign sales department of the Olds Motor Works.

L. D. Sasseer, branch manager for the Peerless company at Kansas City, has been promoted to be sales specialist at the home office, succeeding Mr. Zimmerman.

Garvey, Findling, Rossman Promoted

A. H. Garvey has been appointed manager of the body division of the Packard Motor Car Co., in place of E. H. Kotcher, resigned. Oscar Findling is now manager of the carriage division, filling the position left vacant by Mr. Garvey's advancement. Frank Rossman takes Mr. Findling's place as superintendent of the carriage division.

Heftler Goes Abroad

V. R. Heftler, president of the Zenith-Detroit Corp., has left for Europe where he will spend several weeks investigating conditions in various countries. Part of the time Mr. Heftler will spend in consultation with the officials of the French factory of the Zenith Corp.

Burford and Lanchester in Canada

H. G. Burford and Frank Lanchester, representatives of the British Motor Manufacturers & Traders Association, were recently in Toronto, looking into the advisability of manufacturing a light British 10 hp. automobile in Canada.

Dodge and Bayne Resign

H. E. Dodge and Donald Bayne have retired as directors of Hare & Chase, Inc., Philadelphia, it is announced.

Cuban Transport Congress a Success

N.A.C.C. Officials on Return Report Impetus Given Island Good Roads Movement

NEW YORK, March 17—The National Automobile Chamber of Commerce officials took part in the Cuban Automotive Transport Congress at Havana, March 11-13, and are now in Florida on their way home. They have reported to the Chamber that the congress was a great success and served as a further impetus to the good road movement in Cuba, and also as developing good will between the United States and Cuba.

John N. Willys told the Cubans that every dollar expended in road improvement in the United States has been returned in increasing property valuation alone; that the automobile industry stimulates other business and is largely instrumental in raising living standards; that the automobile and good roads are time-savers, increase the earnings and leisure of individuals, assist the Government, and encourage the establishment of new industries.

Roy D. Chapin described the influence of the automobile in increasing understanding between people, and H. H. Rice told how experience has taught the United States in handling highway traffic problems. D. C. Fenner, of Mack Trucks, Inc., described the engineering and financing assets of road improvement. Alfred Reeves addressed the Havana dealers association and the Rotary Club, and G. F. Bauer, secretary of the N. A. C. C. foreign trade committee, also spoke at the Congress. Carlos Miguel de Cespedes, Minister of Public Roads, was chairman.

Dainty Cab Buys 25 More Indian Taxicabs

SPRINGFIELD, MASS., March 16—The Dainty Cab Co. of Baltimore has bought 25 more Indian taxicabs, and five of them have been delivered. Melville Stevenson, proprietor of the company, came to the factory and rode back in one of the cabs. He said that they are being much used by professional men in making calls.

The Dainty Cab Co. bought the first 10 of these three-wheeled cabs sold from the factory several months ago.

Watson Truck Directors Consider Company Sale

CANASTOTA, N. Y., March 15—A special meeting of the stockholders of Watson Truck Corp. will be held here Mar. 19 to consider the directors' proposal to sell the concern to interests ready to organize a new corporation with financial backing sufficient to operate the business on a sound basis.

The Watson concern was organized in 1920 to acquire the Empire Axle Co., Inc., Dunkirk, N. Y., and the Watson Products Corp., Canastota. The former was in bankruptcy and the latter was about to go into a receivership.

So far, the Watson Truck Corp. has not had adequate working capital, but it has done a business of between $400,000 and $500,000 per year, according to the president, Harry J. Clark. The corporate deficit for 1925 was $901,464. The company has paid all interest on indebtedness, and on funds borrowed for working capital, but no dividends.

HUDSON BODY AND FENDER UNIT BURNS

DETROIT, March 15—Fire partly destroyed the new body and fender plant of the Hudson Motor Car Co., here yesterday. About one-third of the plant was gutted. R. B. Jackson, president and general manager of the company states that no estimate of the loss has been made.

It had been planned to start operations in this plant early in April, with 1500 men employed.

Austin Motor Co. Lowers Car Prices

LONDON, March 1 (*by mail*)—Big reductions in the prices of all models of the 12 hp. Austin cars (four cylinders 2⅞ x 4 in., four speeds, four-wheel brakes and 112 in. wheelbase) are announced today.

The five-seated phaeton is £295 (old price £340), sedan £395 (£455), four-door coach £365 (£395) and landaulet £425 (£470).

These reductions are stated to have been due to production economies, for in the last two or three months extensive additions to the plant, a new engine test shop and additional elevators and conveyors have been brought into use, and considerable reorganization has been effected in many departments.

French Govt. Abandons Automobile Tax Change

PARIS, March 4 (*by mail*)—In view of strong trade opposition, the French Government has abandoned its project of substituting a value tax for the present automobile tax.

The main argument of the French industry was that an annual tax based on a percentage of the purchase price of the car would be beneficial to American machines and particularly the Ford.

New Federal Dealers

DETROIT, March 15—About 80 dealers have signed contracts as Federal dealers since the first of the year, F. L. Pierce, vice-president and director of the Federal Motor Truck Co., has announced.

James J. Storrow Dies in New York

Was Chairman of Board of Nash Motors and Noted Financier

BOSTON, March 16—James J. Storrow, chairman of the board of directors of the Nash Motors Co., was buried here today. He was widely known as a banker, being the senior member of the firm of Lee, Higginson & Co., one of the largest financial houses in this country.

When Charles W. Nash resigned from General Motors, it was Mr. Storrow who aided in purchasing the Thomas B. Jeffrey Co., which Mr. Nash has made such a conspicuous success. He was also instrumental in starting the Lafayette Motors Corp. Some years ago he aided in the reorganization plans of General Motors Corp. and served as one of its directors.

Mr. Storrow had not been in good health for some years, but he possessed an indomitable spirit for work. He was taken ill in New York a few weeks ago and died there on Saturday.

He was well liked in the Nash organization and stood always ready to be of service to its members. When Mr. Nash was in Boston last week to attend the Nash dinner during the automobile show, he went down to New York to pay Mr. Storrow a visit.

British Makers Would Improve Roads Overseas

LONDON, March 5 (*by mail*)—Giving evidence before the Government committee on industry and trade, Col. A. Hacking, representing the Society of Motor Manufacturers, pointed out that road conditions in countries overseas where markets for automobiles existed had a very important influence on the potential volume of export trade to be done with such countries, and, therefore, upon the prosperity of the motor industry.

On that account, he urged that it was necessary for the Government to consider the question of road development in the British colonies and dominions as one of equal, if not greater, importance than the development of railroad systems and to foster new road construction as they had encouraged railroad development in the past, inferring the granting or guaranteeing of loans for that purpose where necessary.

Lincoln Car Production is Raised to 40 a Day

DETROIT, March 15—Production of the Lincoln has been increased to 40 cars per day, the highest ever run by the company, it was announced today.

Custom-built and standard types of coachwork will be effected in equal proportion. For the time being, output of open sport types will be stressed.

Employment Now Reflects Prosperity

Present Forces to be Increased in Next 30 Days, Says U. S. Bulletin

WASHINGTON, March 18—Plants manufacturing automobiles and automobile accessories during February increased both production and employment, and there is every indication that present forces will be increased during the next thirty days, according to the March issue of the official employment bulletin of the U. S. Employment Service just made public here. An analysis of the reports generally received by the Labor Department for February shows the same small volume of unemployment apparent throughout the country as at the close of January.

In Michigan, the bulletin discloses, the automobile industry is operating on peak-production schedules and employment conditions are very satisfactory in this line.

Summaries of Reports

Following are February employment summaries from other automotive centers:

Detroit: A slight shortage of skilled mechanics is reported, particularly in the automobile industry.

Grand Rapids: Automobile body plants and tool and die shops are working overtime.

Flint: Automobile and accessory factories are calling for tool designers and automatic machine operators. A large automobile body plant is under construction which will employ about 3,000 workers when completed. One automobile company is working overtime. About 300 men are employed on the building program.

New York: The automobile plants and body-building factories are extending their operating schedules and increasing their forces.

New Jersey: The automobile industry is gradually approaching normal schedules and further improvement in these lines is expected.

Ohio: High production schedules in the automobile industry are being maintained, with excellent employment conditions existing.

Wisconsin: Automobile and automobile accessory plants report full employment, and, in some localities, there is a shortage of skilled workers.

Impartial Enforcement of Traffic Laws Urged

WASHINGTON, March 15—Impartial enforcement of traffic laws without regard to business, social or political standing of offenders, is urged by the Committee on Enforcement of the National Conference on Street and Highway Safety in its report just made public here. The report will be submitted to the National Conference at its sessions on Mar. 23, 24, and 25.

The committee strongly disapproves the fee system. It holds that neither the traffic officers nor the courts should receive any part of the proceeds of money collected from traffic convictions. It further points out that pedestrians are involved in more than half of all personal injury accidents, and urges that special vigor be applied both to the punishment of vehicle operators and of pedestrians.

Detroit Employment Sets New Records

DETROIT, March 15—Labor employment in the Detroit area continues to exceed the records recently set.

For the week ended March 13, employment in the different factories, including automobile and accessory manufacturing plants, reached a new high total of 274,399, which is 2472 better than a week ago, and 59,807 better than for the corresponding week of 1925.

Of the week's total, approximately 192,079 are employed in the automobile and accessory manufacturing plants. This is 1731 better than the total number employed for the week ended March 6, 1926.

Henry Disston & Sons Opens Detroit Branch

PHILADELPHIA, March 18—A new Detroit branch is being opened by Henry Disston & Sons, Inc., manufacturer of saws, tools, files, and steel. This branch, at 620 East Hancock Ave., will consist of a complete warehouse, offices and all necessary equipment for giving prompt service to users of power saws and other mill goods equipment in that territory.

The steel sales will be in charge of K. L. Clark, western representative for steel sales, whose headquarters in the past has been at the Disston branch in Chicago.

The mill goods division will be under the direction of L. L. Mather, who has been a member of the Disston organization for many years and who will continue to supervise the Middle Western branches at Cincinnati, Chicago, and Atlanta.

Virginia Adopts Gasoline Tax of 4½ Cents a Gallon

WASHINGTON, March 18—Virginia motorists, effective immediately, will pay a gasoline tax of 4½ cents a gallon as a result of the new tax bill passed by the State Senate at Richmond by a vote of 32 to 6. The tax heretofore was 3 cents a gallon. Gov. Byrd suggested 4 cents. The extra ½ cent will go to counties if they match the amount by their own appropriations, according to the provisions of the bill.

The action of the State Senate is in line with the announced policy of Gov. Byrd, who recently took office, of developing a modern highway system for the state to replace many of the dilapidated roads connecting much-travelled road-ways, especially between northern and southern points.

Motor Wheel Sales Outlook Promising

Expected to Exceed $12,500,000 in First Six Months of 1926

LANSING, March 16—Sales of the Motor Wheel Corp. for the first six months of 1926 will be more than $12,500,000, unless an unforeseen slump occurs in the automobile industry, stockholders were informed at a meeting last week by H. F. Harper, president.

Gross sales for 1925 amounted to $26,233,969, against $20,984,109 in 1924, and the increase in production of wheels and parts was 38 per cent.

Reduces Obligations

During the year the corporation reduced its prior obligations by the retirement of all bonds, amounting to $1,568,500, and by the purchase in the open market of $661,800 par value preferred stock. Outstanding preferred stock, as of Jan. 1, 1926, was only $1,008,200.

As of Dec. 31, 1925, current assets were $5,808,848 and current liabilities $1,200,849, against $5,491,739 and $1,084,443, respectively, at the end of 1924. Surplus stood at $5,788,918, against $4,099,564 at the end of 1924.

Transportation Analysis Prepared by Ohio State

COLUMBUS, OHIO, March 15—The Bureau of Business Research of the Dept. of Commerce of Ohio State University, has planned a thorough analysis of the development of motor transportation in the United States with a comparison with other forms of transportation. In the treatment of the problem, emphasis will be placed on the present situation in Ohio.

The study or survey will include an analysis of the operating revenues and expenses of Ohio's motor carriers, the geographical distribution of motor companies in relation to other forms of transportation and to the location of hard-surfaced roads, an analysis of the services offered by other forms of transportation, as well as an estimate of the volume and kinds of commodities carried by both motor truck lines and steam and electric lines.

Davis Industries Buys Plant

KOKOMO, IND., March 17—The Davis Industries, Inc., of Chicago, manufacturer of radios, has purchased the big assembly plant of the bankrupt Haynes Automobile Co. here from the bondholders at a price announced as $150,000.

The Chicago concern is to take possession May 1, and expects soon to be in production on radio sets, which are to be marketed by mail. Six of the original eight buildings of the Haynes plant remain unoccupied, but it is believed that one or more will be sold soon.

Rubber Report Fails to Urge Legislation

Congress Committee Does Not Make Recommendation for Any Drastic Action

WASHINGTON, March 18—The report of the House Committee on Interstate and Foreign Commerce, which has been investigating raw material monopolies, fails to recommend any drastic action by Congress, tacitly leaving to the public and the producers the problem of obtaining normal supplies of rubber at reasonable prices.

It notes favorably the measures taken to economize in the use of rubber and projects aimed at American-owned rubber plantations in non-restricted areas.

Burden was Unwarrantable

For the rest, the report merely records the development in the crude rubber and other similar situations, and shows how prices went soaring under the restrictions of foreign monopolies. The burden on American consumers is declared to be entirely unwarrantable.

Meanwhile, it begins to appear that Congress will be asked for aid of a definite character by prospective growers of rubber in the Philippines. Harvey Firestone, Jr., is known to have sent cable dispatches from Manila, where he now is, that the present land laws threaten to hamper plans for plantation development in the Islands.

The present land laws restrict ownership to a maximum of 2500 acres. Furthermore, legislation would be required to enable the importation of foreign labor, as the Filipinos, small in stature, are not fitted for the heavy initial work that must be undertaken on rubber plantations.

Motor Freight Decisions Handed Down on Coast

SAN FRANCISCO, March 17—The authority of the state railroad commission to refuse permits to radial motor vehicle operators is upheld in a decision handed down by the California State Supreme Court. The decision, incidentally, denied writs of review and mandate to the operators.

Some time ago B. Moore and George Harms applied to the railroad commission for a certificate to operate motor freight service between Sanger, Cal., and points within a radius of 100 miles of that town.

The commission refused the certificate, on the ground that it had no jurisdiction in the case, and a writ for review was denied.

The California Interstate Motor Freight Association also was denied a writ of mandate to compel the railroad commission to assume jurisdiction over all motor-freight operators, whether individuals, firms or corporations, within the state. The decision is of considerable importance because it compels all freight and passenger carriers for hire to operate between specified points. Furniture movers and warehousemen operating truck fleets are particularly concerned, since they are unable to specify the destinations between which their trucks will operate at all times.

Hardwood Inquiries Indicate Record 1926

ATLANTA, March 17—A further steady increase in hardwood sales to the automobile, body and implement makers is reported in the last two or three weeks by manufacturers in the Atlanta lumber market.

Sales have now reached the highest point they have ever attained at this time of the year, and inquiries are in sufficient volume to indicate that 1926 will undoubtedly prove the largest year in the history of the business.

Primary demand is for thicker dimensions of white ash, although maple, elm and hickory are also in fair demand.

Prices are generally unchanged, having held to a firm basis ever since the first of the year.

Doble Corp. Officials Sentenced in California

SAN FRANCISCO, March 17—Abner Doble, president of the Doble Steam Motors Corp., was sentenced to one to five years in the penitentiary at San Quentin, by Judge Michael Roche in Superior Court here March 6. Harold Haven, former secretary of the Doble concern, and F. G. Cox and W. E. Barnard, fiscal agents, were fined $5000 each. All four defendants were accused of violating the corporate securities act in connection with the sale of stock beyond the limit set in the state permit.

Notice of appeal was filed immediately, and bail was fixed at $10,000 cash, $25,000 bond, for each of the defendants.

These men were indicted Sept. 2, 1924, charged with selling $500,000 more stock than the permit issued by the state corporation commissioner permitted them to sell. It was also alleged that there were no cars being built for the commercial market, that enormous salaries were being paid to executives, and that all the funds were being eaten up by overhead expenses.

Auburn Shipments Up 27 Per Cent in February

AUBURN, IND., March 16—The Auburn Automobile Co. announces that February shipments were the greatest of any month in the history of the organization, exceeding those of January of this year, which estabished the previous record, by 27 per cent.

Shipments for the first two months of the year exceed the corresponding period last year by more than 400 per cent, and the number of cars shipped are equal to the shipments for the first five months of 1925.

White Motor Sales Largest on Record

Increase of $11,098,856 Over 1924—Net Profit Equals $10.55 a Share

CLEVELAND, March 18—The White Motor Co. for 1925 reports net profit, after provision for Federal taxes and giving effect to the undistributed earnings of the White Motor Securities Corp. and the White Motor Realty Co., of $5,276,245, equal to $10.55 a share on the capital stock, compared with $4,084,238, or $8.17 a share in 1924. After deducting dividends of $2,000,000 in 1925, the balance carried to surplus is $3,276,245, bringing the total of this account to $14,810,402.

Gross sales were the largest in the history of the company, amounting to $57,673,594, or $11,098,856 more than in 1924.

The balance sheet as of Dec. 31, 1925, shows total current assets of $30,853,229, against total current liabilities of $5,400,068. As of the corresponding date a year previous, the totals were $28,522,448 and $5,559,425 respectively. The current assets account for the end of 1925 would have been much higher had it not been for large transfers of notes receivable to the White Motor Securities Corp., which has a separate balance sheet.

Inventories stood at $16,662,832, against $14,547,102 at the end of 1924.

Niles-Bement-Pond Co. in Improved Position

NEW YORK, March 17—The annual report of the Niles-Bement-Pond Co. for 1925 shows a net loss of $799,519, after all deductions, against a net loss of $1,185,808 in 1924. The profit and loss surplus on Dec. 31, 1925, aggregated $3,547,315, against $7,244,790 at the close of the previous year.

James K. Cullen, president, in his report to stockholders, said in part:

"Sales during 1925 were somewhat less than for the preceding year. So far as can be judged at present, there will be no little change in volume of business during the first half of 1026. If this volume continues or improves, it is expected that results of operations for 1926 will show material improvement, particularly in the second half of the year, when the effect of most of the changes in reorganization will be reflected in earnings."

Zapon Co. Opens Branch

STAMFORD, CONN., March 17—The Zapon Co., manufacturer of pyroxylin base lacquers and lacquer enamels, announces the opening of a branch office and warehouse at 8810 Bessemer Ave., Cleveland, Ohio. In the past, users of Zapon products in the Cleveland section have been served either from the factory here or from the warehouse in Chicago.

Diana Makes Engine and Chassis Changes

ST. LOUIS, March 15—A number of important changes have been made in both the power plant and chassis of the Diana eight.

The capacity of the battery has been increased to 140 amp. hr. and changes have been made in the third brush design. The water pump has been moved from the top to the front of the block and a header pipe attached to the cylinder-head. The fan-pump unit is now driven by a V-corded belt. The radiator core is of the hex type, 3 in. in depth with a copper fin for increased efficiency. Valve tappet guides are 7/16 in. longer and the overall length of the pistons has been increased ¼ in.

The oil capacity of the crankcase has been increased two quarts by adding 1½ in. to the depth of the oil-pan and four baffle plates are now riveted in to prevent surging. The Purolator oil filter and the United air cleaner are now regular equipment. The exhaust pipe is covered with asbestos to prevent heat reaching the interior of the car.

The frame has been greatly stiffened by increasing the thickness of the side rails from 5/32 to 3/16 in. and by the provision of additional gussets and heavier spring brackets and engine supports. Several changes have been made in the steering system. In addition, the differential is now of the four-pinion type, with overhung drive pinion mounting.

Wing Radiator Cap Out

MIDDLETOWN, CONN., March 17—The Welker-Hoops Mfg. Co., manufacturer of automobile accessories, has recently added to its line a wing radiator cap of an Egyptian design.

Coming Feature Issues of Chilton Class Journal Publications

May—Automobile Trade Journal—Biggest Market Issue.

May 6—Motor Age—Sales and Service Reference Number

To Form National Bus Organization

WASHINGTON, March 15—Representatives of 15 bus operators' associations will meet here Mar. 19 to perfect, through the American Automobile Association, the permanent National organization of the bus industry of the country.

The body, which is already functioning in a preliminary way, will be known as the bus division of the A. A. A., and is expected to merge the bus men of the country into a unit, through which their difficulties may be ironed out by means of close cooperation.

Delegates to the meeting, it was announced today, will also be on hand to attend the Senate committee hearings set for Mar. 22-23 on the Cummins bill, which provides for the regulation of bus lines in interstate commerce. The Cummins bill, which was introduced at the instance of the National Association of Railroad & Utilities Commissioners, is pending before the Senate committee on interstate commerce.

Prior to appearing before the Senate committee, the bus operators will determine on changes which they desire in the bill to protect the industry adequately.

Boston Annual Show Proves Successful

BOSTON, March 13—Boston's 24th Annual Motor Show ended tonight. It was a success as in the past, but there was no overwhelming sweep of sales such as Boston had heard was being made in shows in the West. Some of the smaller cars did more than a year ago, others were about even. In the higher-priced class, a few exceeded last year's sales and others were even or fell slightly.

Attendance at the show during the early days was not as large as last year. But the crowds were more comfortable to handle and talk to at the spaces. As the week wore on, the attendence jumped and Friday and Saturday nights the building was jammed.

All things considered, the show may be classed as one that satisfied the exhibitors.

Los Angeles-Seattle Air Mail Starts on April 1

SAN FRANCISCO, March 16—A new air mail route between Los Angeles and Seattle, with a stop here, will be inaugurated in April, according to announcement by W. Irving Glover, second assistant postmaster general, who has just concluded an inspection trip over the route of the new service.

The air mail will be handled on private contract and is expected to speed up mail handling on the coast by about 30 per cent. Fifteen new planes are to be purchased by the Government, each capable of carry 1000 lbs. of mail.

McGuckin Co. Moves

PHILADELPHIA, March 15—The Eugene McGuckin Co., advertising agency, will be located after this date in the Insurance Co. of North America Bldg., 1600 Arch St., here.

Calendar of Coming Events

SHOWS

Apr. 3-14 — International Motor Car Show, Frankfort-on-Main, Germany.

May—International Street and Highway Traffic Safety Exhibition, City Hall, Vienna, Austria.

May 25—International Exhibition of Roads, Transport and Touring, Show Grounds, Argentine Rural Society, Palermo, Buenos Aires.

CONVENTIONS

Mar. 23-25—National Conference on Street and Highway Safety, Washington.

Apr. 14—Tire & Rim Association of America, Inc., Annual Meeting, Hollenden Hotel, Cleveland, O.

Apr. 21-23—American Welding Society, Engineering Societies Bldg., New York City.

May 6-8—National Machine Tool Builders Association, Providence, R. I.

May 13-15—American Gear Manufacturers Association, Tenth Annual Convention, Book-Cadillac Hotel, Detroit.

May 21-28—National Electric Light Association and Electric Truck Manufacturers Association, Atlantic City, N. J.

June 8-10—Automobile Body Builders Association, Detroit, Hotel Statler.

June 14-19 — Automotive Equipment Association, Mount Royal Hotel, Montreal, Canada.

June 16-18—Thirteenth National Convention, Society of Industrial Engineers, Philadelphia, Bellevue-Stratford Hotel.

RACES

Apr. 15—Fresno, Cal.

May 1 — Races at opening of new Speedway, Atlantic City.

May 10—Charlotte, N. C.

May 30-31 — 500-mile race, Indianapolis.

June 12-13 — Rudge-Whitworth 24-hour stock car race, Le Mans, France.

S. A. E. MEETINGS

National

Mar. 25-26—Annual tractor meeting, in cooperation with American Society of Agricultural Engineers, Chicago.

June 1-4—Semi-annual meeting, French Lick Springs, Ind.

Sectional

Mar. 25—Detroit.
Mar. 26—Chicago.
Apr. 7 — Milwaukee.
Apr. 8 — Detroit.
Apr. 8 — Indianapolis.
Apr. 19—Cleveland.
Apr. 22—Detroit.